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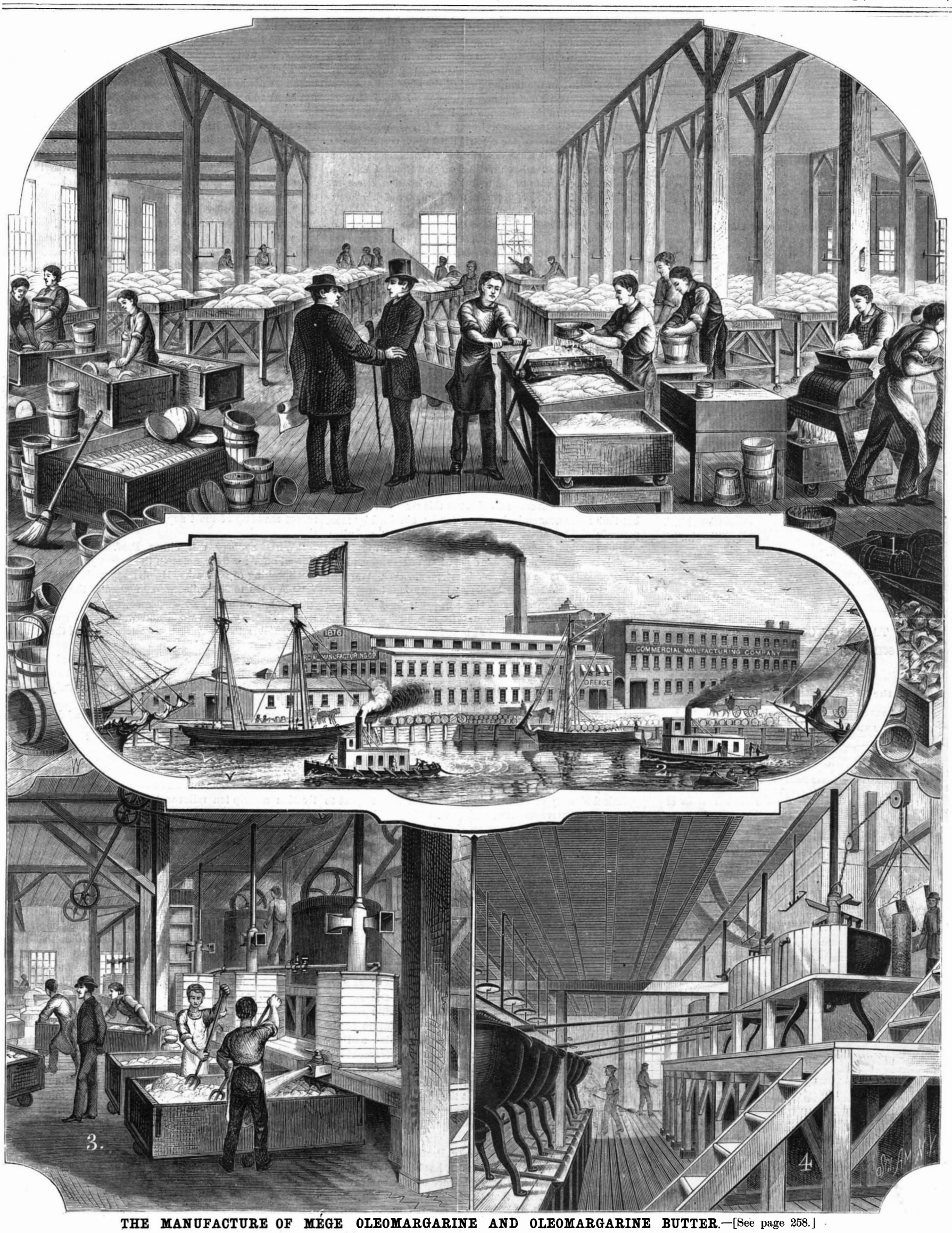

THE MANUFACTURE OF MÉGE OLEOMARGARINE AND OLEOMARGARINE BUTTER.—[See page 258.]

Fig. 1.—One Day's Churning,—Butter Working and Salting. Fig. 2.—View of Commercial Manufacturing Company's Works. Fig. 3.—Churning Room. Fig. 4.—Melting Room.

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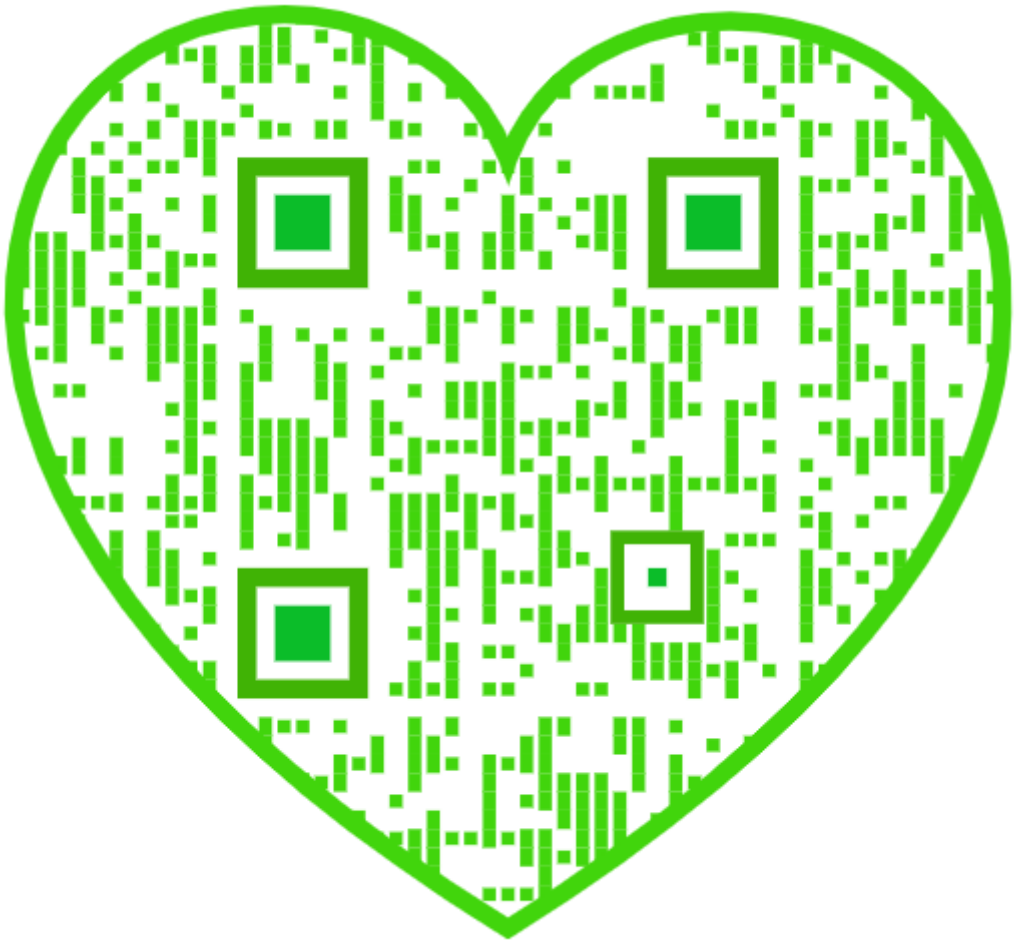

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NEW YORK, SATURDAY, APRIL 24, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

Ajax, the..... 264
Artesian well at 5th Ave. Hotel.. 257
Artificialdiamond process..... 264
Boiler incrustation (7). 267
Boiler leaks, to stop (6) 267
Boiler plate testing machine*.... 262
Boilers. air in (3).... 267
Car coupling, new* 260
Comet. Southern, great..... 264
Coughs, petroleum for 257
Death, sudden, from elec. shock. 257
Desert, Great American..... 256
Diamond process. artificial 264
Eighty miles an hour.... 264
Electro-horticulture 256
Electric machine, home-made... 265
Elephant calf and its mother*. . 263
Engine slides, to adjust (10)..... 267
Eye parasite, the..... 264
Facts about New Zealand 264
Fire by friction..... ... 260
Fish, hybrid 263
Hub mortising machine, autom* 260
Hydrophobia, remedy for..... 264
Inventions, mechanical 261
Inventions, miscellaneous..... 260
Labor, prison..... 264
Mallet. steak-tendering*..... 261
Mill. standard, Bulwer.... 262
Minerals, to separate (1)..... 267
Mining debris problem in Cal.... 237
Moles, dreadful. those..... 257
New Zealand, some facts about.. 264
Oatmeal machine, new*..... 261
Oleomargarine, man'f. *..255, 258, 259
Petroleum for coughs..... 257
Potato diggers, improvement in * 265
Prison labor..... 264
Remedy for hydrophobia..... 264
Retina, human..... 265
Roller suit, the..... 265
Sandstone, a large block of..... 257
Steam yacht (5)..... 267
Sun, central, a, is there?..... . 264
Surprise, pleasant, a..... 264
Temperature of steam, etc. (10).. 267
Vases, Assyrian..... 263
Vehicle, the best 264
Water wheels, power of (4)..... 267
Well, artesian, at 5th Ave. Hotel 257
Writing instrument, new *..... 261
Zinc, to detect in pewter (2)..... 267

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 225,

For the Week ending April 24, 1880.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Proa Ladronia.—Construction.—Hulls.—Deck.—Bulwarks.—Rigging.—Performance. 1 illustration. A new double pleasure boat. 3575
A New Catamaran Steamer. 2 figures. Perspective and plan of a new Catamaran Passenger Steamer for Hudson River..... 3576
The Russian Yacht Lividia. An elliptical steam yacht, 230 feet long, with a breadth of 153 feet. 3576
Derrick Used at Davis Island Dam. By JAMES HARLOW, C.E. Detailed description..... 3576
A Feat in Triangulation. Use of the electric light in geodesy.... 3577
The St. Gothard Tunnel. 28 sections, showing methods of working 3577
Music in the Saw Mills. Effects of sonorous vibrations in mill buildings..... 3578
A Mechanical Skid for Raising Casks and Other Packages. 1 figure. Flesselle's Mechanical Skid 3584

II. ELECTRICITY, LIGHT, HEAT, ETC.—Dynamo-Electric Machines. (Continued from No. 224.) Breguet's Theory of the Gramme machine. 6 figures..... 3580
An Experiment in Induction. 1 figure..... 3581
Electric Lighting in London..... 3581
Recent Wonders of Light. By W. H. PREECE. Nature of light.—Separation of white light into colors.—The new luminous paint.—Artificial lights.—Candle light.—Oil light.—Brief history of gas-light.—Heat and light identical.—Electrical light.—Electrical light and gas light 3582
A New Standard of Light..... 3583
On New Luminous Tubes. By M. TREVE..... 3584
Powers of Eyepieces. 1 figure..... 3584
Flow of Viscous Materials.—A Model Glacier..... 3584
Precautions in Comparing Weights 3584

III. TECHNOLOGY AND CHEMISTRY.—Modern Autographic Printing Processes. By THOMAS BOLAS, F C S.—Lithography.—Zincography.—Electro-Chemical Printing.—The Papyrograph.—The Edison Electrical Pen.—Zuccato's Trypograph.—Collography.—Pellet's Plan for Copying Drawings 3579
Improved Filters. 2 figures 3580
Mirrors in Photography 3580
The Function of Chlorophyl 3584
The "Egasse" Disinfectant..... 3585
On the Solubility of Solids in Gases. By J. B. HANNAY and JAMES HOGARTH. A Royal Society paper of much importance... 3585
Julle's Extraction Apparatus. A new automatic extraction apparatus 1 figure..... 3586
Examination of Mustard. By CHANNING T. GAGE, Ph.G. 3 figures..... 3586
Alcohol in Unfermented Fruit Juices. By Dr. GUTZEIT..... 3586
Mineral Lubricating Oils By Dr. OSCAR BRENIKER..... 3587
Nitrogen, Sulphur, and Chlorine in Organic Bodies. By Dr. P. SPICA 3587
Sulphureted Hydrogen in Beer..... 3587
Action of Ozone on Certain Noble Metals. By Prof. A. VOLTA... 3587
Preparation of Crystals for the Polariscope 3587
The Science of Gas Burning..... 3587

IV. ARCHITECTURE, ETC.—The Ecclesiastical Art Exhibition Building, London. 1 illustration..... 3587
Art and Nature. 4 figures. Various artificial and natural objects as seen under the microscope..... 3589

V. NATURAL HISTORY, GEOGRAPHY, ETC.—Proportions and Conformations of the Horse 1 figure. La Porte's proportions and bone structure of the horse..... 3588
Fertilization of Flowers by Humming Birds 3588
Adaptation and Heredity in the Cicindelidæ..... 3588
The Fossil Lovers (verses)..... 3589
A Ramble through Ceylon..... 3589
The Watersheds of the State of New York..... 3589
Farming in Southwestern Minnesota..... 3589
The Fruit Crop of the Country..... 3590

ELECTRO-HORTICULTURE.

It has often been remarked by Arctic explorers that plants which require several months to ripen their fruit in temperate climates complete the same round of budding, blooming, and maturing in a few weeks under the continuous sunshine of the Arctic summer. A corresponding rapidity of growth is shown by annuals in sub-Arctic latitudes, as in northern Norway, where the summer sun, though never reaching a high altitude, yet remains above the horizon from sixteen to twenty hours a day.

A species of corn which flourishes in Canada failed to ripen in Kentucky, though the warm season there is some weeks longer than in Canada. The superior rapidity with which vegetation pushes forward during periods of full moon and light nights has also been widely noticed; these facts of general observation, with others of a more experimental character, going to show that many of the plants of our temperate climate thrive in proportion to the duration of the daily (direct or indirect) sunshine they enjoy, rather than according to the temperature of the air.

A curious confirmation and extension of these observations in regard to the influence of light upon vegetation is furnished by the recent experiments of Dr. C. W. Siemens, testing the influence of the electric light upon certain plants. These experiments were described by Dr. Siemens at considerable length at a late meeting of the Royal Society in London. According to the report of the London *Times* the method pursued by Dr. Siemens was to plant quick-growing seeds and plants, such as mustard, carrots, ruta-bagas, beans, cucumbers, and melons in pots, dividing the pots into four groups, one of which was kept entirely in the dark, one was exposed to the influence of the electric light only, one to the influence of daylight only, and one to daylight and electric light in succession. The electric light was applied for six hours each evening—from 5 to 11—and the plants were then left in darkness during the remainder of the night. The general result was that the plants kept entirely in the dark soon died; those exposed to the electric light only or to daylight only throve about equally; and those exposed to both day and electric light throve far better than either, the specimens of mustard and of carrots exhibited to the society showing this difference in a very remarkable way. Dr. Siemens considers himself as yet only on the threshold of the investigation, but thinks the experiments already made are sufficient to justify the following conclusions:

1. That electric light is efficacious in producing chlorophyl in the leaves of plants, and in promoting growth. 2. That an electric center of light equal to 1,400 candles placed at a distance of two meters from growing plants appeared to be equal in effect to average daylight at this season of the year; but that more economical effects can be obtained by more powerful light centers. 3. That the carbonic acid and nitrogenous compounds generated in diminutive quantities in the electric arc produce no sensible deleterious effects upon plants inclosed in the same space. 4. That plants do not appear to require a period of rest during the twenty-four hours of the day, but make increased and vigorous progress if subjected during daytime to sunlight and during the night to electric light. 5. That the radiation of heat from powerful electric arcs can be made available to counteract the effect of night frost, and is likely to promote the setting and ripening of fruit in the open air. 6. That while under the influence of electric light plants can sustain increased stove heat without collapsing, a circumstance favorable to forcing by electric light. 7. That the expense of electro-horticulture depends mainly upon the cost of mechanical energy, and is very moderate where natural sources of such energy, such as waterfalls, can be made available.

In the discussion which followed the reading of the paper it was pointed out that the evidence seemed to show the practical identity of solar and electric light with respect to their action on vegetation; and it was suggested that the method of subjecting plants to electric light might afford great facilities for the scientific investigation of the influence exerted by light, as compared with other agencies, in promoting the formation of the active principles or most valuable constituents of plants, such as the quinine of the cinchona bark, the gluten of wheat, etc. Before concluding his observations, Dr. Siemens placed a pot of budding tulips in the full brightness of an electric lamp in the meeting room, and in about forty minutes the buds had expanded into full bloom.

THE MIGRATION OF THE GREAT AMERICAN DESERT.

The irrepressible conflict between herders and farmers along the Kansas and Nebraska frontier is steadily growing in magnitude, and on its issue depends the future of the great tract of country between the 100th meridian and the Rocky Mountains. The stock raisers and government surveyors pronounce the region fit only for pasturage lands, and ask that it be leased in large tracks to herders; the farmers claim, on the other hand, that the region embraces some of the finest farm lands in the country, and insist that it shall be held subject to homestead pre-emption and timber claim entry.

As spokesman for the latter party, Professor C. D. Wilber, of Wilber, Saline County, Nebraska, has been giving a correspondent of the *Inter-Ocean* a history of the controversy, and no end of evidence that the desert makers are wholly and designedly in the wrong. The desert country reported as lying west of the 100th meridian has, he maintains, no real existence. The entire region west of the Missouri River was formerly held under the same reproach. Now the country bears magnificent crops of corn, wheat, rye, oats, barley, in many instances exceeding in productive capacity the famous valleys of the Mohawk, the Genessee, the Muskingum, and the Miami.

Touching the agricultural value of this region and the recent change of opinion regarding it by those who have learned its value, Prof. Wilber said:

"Only eight years ago, being one of an excursion party—chiefly the pioneers of the M., K. and T. R. R. from New York city, I made an extended tour over the plains toward the Colorado line. Mayor Opdyke said: 'The country is, indeed, beautiful; but what a pity it is so worthless. Is there not some way to overcome this desert condition? It must remain a waste thousands of years. The Indians are welcome to it, if only they will keep it.' Messrs. Skiddy, Schell, Parsons, Dickinson, and other men of great wealth, returned from the Sahara confirmed in their traditions, saying, 'It will never be worth a dime per acre.'

"To-day, ten years later, the New York capitalists are pushing railway lines and branches with unparalleled rapidity, eager to be first in possession of the same country, no longer a desert, dry, sterile, worthless, but, as they now know it to be, the best portion of the continent.

"The Boston capitalists were quite as the New Yorkers. Twelve years ago the wise men of the 'Hub' projected their first Nebraska railroad, from Plattsmouth to Fort Kearney, nearly 200 miles, based upon the usual land grant of 12,800 acres per mile of track. But in this desert Nebraska, as they judged, the less land the better. In the bill conveying the grant it needed only five or ten lines, or a score of words, to have secured gratis the entire route through the great Republican valley, with the accompanying grant of over 4,000,000 acres of the richest lands in America, but by them, at that time, not considered worth asking for. And now, after ten years, the aforesaid wise men of Boston, in the autumn of 1879, passed over the same route with a corps of engineers to choose the route, purchase the right of way, and make ready to spend $10,000,000. They *knew* the country west of Kearney would never be habitable except by Indians, gophers, and owls."

The government experts who have described the country as fit only for pastoral uses, have done so, Prof. Wilber claims, without actual study of the plains they have condemned:

"Whatever they have put on record in their reports mostly concerns the mountainous regions of Wyoming, Colorado, Utah, and New Mexico.

"The plains or middle country of Dakota, Nebraska, Kansas, Eastern Colorado, and Wyoming, have either been wholly neglected or dismissed after hasty visits, with a brief report made up of most superficial and erroneous observations.

"What apology can either Prof. Hayden or Major Powell offer for their notes on the region just referred to?

"Speaking of Nebraska, Hayden says:

"'For 150 to 200 miles west of Omaha the soil is very fertile and can hardly be surpassed, but beyond that there is an absence of both wood and water, which will render it impossible to cultivate the western half of the State of Nebraska successfully.'

"Major Powell, of the United States Geological Corps, says: 'There is not of available land belonging to the United States enough left to make an average county in Wisconsin.'

"There are to-day in Western Nebraska and Kansas, far beyond the 100th meridian, many thousand prosperous farmers, whose full granaries give the lie to the statements of the government explorers, Hayden and Powell."

Last year the acreage of new farms all along the western border of the settlements was enormous, bringing under cultivation a strip ten miles wide, extending north and south through Dakota, Nebraska, and Kansas. Previously the country was barren, but rain follows the plow, as it has heretofore, across a belt 350 miles wide.

"The first settlers, twenty-five years ago, placed the desert limits just west of the Missouri River counties. These being occupied, the desert line was established on the Big Blue, 70 miles beyond. But the farmer invaded the Big Blue Valley, and the desert line was established near Kearney, 190 miles west of Omaha. But the irrepressible plow broke the barrier in so many places that the desert makers fled with their line to the 100th meridian, determined to have and enjoy a desert. But hordes of farmers have gone far beyond and secured farms whose products equal those of Iowa or Illinois."

The desert was a reality; but agriculture has practically abolished it.

"The owners of the great herds of cattle are constantly obliged to retreat before the immense army of emigration from the Canadas, the Eastern and Middle States, and especially from Wisconsin, Illinois, Iowa, and Minnesota.

"Coming with their families and their farming outfit, generally without previous inspection, they become squatters upon any lands not taken at the Land Office. As the land laws are impartial, who comes first is first served, and the herd owner, though a millionaire, as some are, is, much to his disgust, forced further out on the plains.

"The reactions that follow are obvious. The ranchmen or herders insist that the country will never raise grain, is only fit for cattle and sheep, is a desert, without water for irrigation, and insufficient rain. It is by nature's law the herdsman's country, and the national law must be made to coincide. To bring these laws into effect is the animus of

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the present land movement, and to prepare the way for it is the object of the Public Land Commission sent out by the last Congress, with Messrs. Hayden, Powell, and Clarence King in charge. These gentlemen have made their preliminary report, full of desert as usual. The two former are professional desert makers, and Clarence King is a member of the firm of Davis & King, who have a herd of over 20,000 cattle in this desert—'the herdsman's paradise.' The report to Congress was, of course, a foregone conclusion."

The prize in this contest is the control of nearly 500,000,000 acres of land, which the herdsmen want to have divided into large tracts and leased at low rates for grazing; while their opponents, who last year carved 100,000 new farms out of the desert, are equally anxious that the present quarter-section system shall be preserved.

The top soil of the larger part of the disputed region is identical with the loess of the Rhine Valley and of the most fertile parts of China, and lies from two to five feet deep, slightly colored with burnt or decayed vegetation. The subsoil is the same in composition but uncolored, showing its original light brownish-yellow hues. During the present year the pioneer farmers promise to exceed the work of last year in winning over a broad belt of the "desert" by covering the ground with crops and making way for a still further advance of rainfall.

THE MINING DEBRIS PROBLEM IN CALIFORNIA.

A recent report to the U. S. Chief of Engineers, by Lieutenant-Colonel G. H. Mendell, reviews at considerable length the changes wrought in the Sacramento River and its tributaries by placer and hydraulic mining, and proposes a system of dams for arresting the destruction of those streams and the progressive covering of their valleys with mining debris. Already the alluvial lands thus buried are estimated at 14,600 acres; and the river beds have been raised so high that they are constantly making new channels, causing heavy losses to farmers and the apprehensions of graver disasters in the future. The chief source of the trouble at present is hydraulic mining, placer mining having for the most become a thing of the past, and quartz mining adding but little to the debris. On this point Lieutenant-Colonel Mendell says:

"Although the hydraulic miner is now unquestionably responsible for the continual accretions that raise the levels of the beds of the watercourses year by year, yet the history of these deposits show that he is not responsible for all that is past. Hydraulic mining, in the effective form it now presents, is of quite modern growth. The earlier mining done from 1848 to 1860 was done by manual labor. Water was used to work out the gold, but was not used to excavate to any great extent. The water was not used under pressure. During these years, and especially during the first five or six years, counting from 1848, many thousands of men were employed in placer mining all through the gold districts. During all these years there was no great flood. The winter of 1861–62 was the occasion of the severest flood California has known since 1848. This flood found all the little gulches and the beds of larger streams stored with the material resulting from ten years' mining. This freshet brought the sand and gravel down in immense quantities. Whatever filling of the channel may have taken place previous to this time, it appears to have escaped notice. The winter of 1865, which gave high water, increased the evil. The placer mining had been nearly if not entirely exhausted by this time. Each successive flood has made things worse and worse."

The quantity of earth washed into the rivers by hydraulic mining is shown in the following estimates:

An inch of water running for 24 hours is taken to be 2,230 cubic feet. On the San Juan ridge, between the South and Middle Yuba, the State Engineer reports that in the year beginning November, 1878, 2,819,317 inches of water were used, while the quantity ascertained to have been used during the same time in the drainage basin of the Yuba is 5,893,962 inches.

An inch of water will excavate at all rates from 1 to 7 or 8 cubic yards of earth. The Spring Valley mines at Cherokee have been excavated to the extent of 23,000,000 cubic yard in 7 years, with an average quantity of 2,250 inches. Allowing 310 days to the year, the daily excavation for an inch of water is about 4 yards. The material here is very light, mostly sand, fine gravel, and clay in cliffs 400 feet high. The grades of the sluice is perhaps an average, being 1 foot in 24.

It would, perhaps, be an excessive allowance to apply this rate of excavation to the Yubas. It is, however, within the probable limits of truth to place the amount of material excavated in the basin of the Yuba at 2½ yards to the inch. This allowance makes they early amount placed in the stream and its tributaries at 14,000,000 or 15,000,000 cubic yards. On the other mining streams, the Feather, Bear, and American, there is no reliable information as to the amount excavated and deposited in the streams.

The attempt has been made to estimate the quantity of material in the Yuba and Bear rivers that has not yet reached the navigation lines, but which lies in the path of the floods, and is, therefore, liable to be washed farther and farther in greater or less degree, by every freshet. These deposits are the result of past mining. If no more were added, they are yet capable of doing a great injury to the water courses below.

The amount lying in the bed of the main Yuba and its branches, above the Yuba mill, is 49,263,200 cubic yards. The amount below the Yuba mill as far as Marysville, 14,600 acres covered, average depth assumed to be 4 feet, is 94,288,664. Total, 143,551,864.

On the Bear River the estimate is 148,248,000, of which 62,088,000 lies in the plains, and 86,160,000 cubic yards are in the bed of the stream above the foothills. This estimate makes the total amount in the two streams to be 291,799,864 cubic yards. It is not pretended that this estimate is accurate. It could not be so without boring the deposits in thousands of places. It is made from the best information available. Its use, in its imperfect accuracy, is to convey to those who have not the opportunity of seeing it some conception of the enormous dimensions of the phenomenon.

The character of this deposit has already been defined. It is sand, gravel, "slickens" (fine sand and clay), and stones.

The part that has reached the plains to this time is sand, gravel, and slickens. The layer of gravel and cobbles remain, as yet, in the foothills. There is some coarse gravel in the Yuba, four or five miles below the Yuba mills.

The Yuba having been filled 125 feet at Smartsville, and perhaps 15 feet at Marysville, the slope of the river between these points, a distance of 18 miles, has been increased 110 feet, which is about 6 feet per mile. This about doubles the original slope.

This tendency to increase the slope of this part of the river brings the gravel lower and lower. This is counteracted, to some extent, by the great breadth of the stream in the plains at high water. Small gravel is, however, found now in small quantities within three or four miles of Marysville. With the increase of slope under the influence of freshets we must expect this gravel to reach first the Feather, and in due time the Sacramento. Once in either of these streams in considerable quantities, it cannot be expected to move under the influence of the current, or if it did, the effect would be to transfer it to a more objectionable place. In the Feather the pools that formerly alternated with ripples have been filled. It is estimated by the State Engineer Department that there is a deposit in the Feather River of 40,000,000 cubic yards, and in the Sacramento below the mouth of the Feather something like 100,000,000 cubic yards.

Great as are the quantities of sand and gravel already washed into the streams, the remaining gold-bearing gravel ranges contain vastly more, which future mining is sure to displace. It thus becomes a matter of vital importance to arrest the flow of detritus into and upon the river valleys, which can be done only by storing it in places where it can do little harm. To this end storage reservoirs are proposed in the foothills of the Sierra Nevadas, to be formed by throwing dams, or more correctly rip-rap obstructions, across the streams into which the material is discharged from the mines. The stones required are found abundantly in the foothills, and they have only to be loosely piled together, the slopes of the mass to depend upon the size of the material.

The construction of dams of this sort is inexpensive, involving no skilled labor. It is estimated that in the first three dams of the Yuba River 1 cubic yard of stone will impound 242 cubic yards of detritus. For the other dams, six or more in number, 1 cubic yard of stone will impound about 580 yards. The estimated average cost of the first three dams is put at $1.50 per yard; for the remaining dams $2.50 a yard. For the lower dams the total average cost will be about three-fifths of a cent for each cubic yard of detritrus stored. For the upper dams, the bed of the stream having been brought to a slope of 10 feet to the mile, the expense of storage will be reduced to less than half a cent a yard. No calculation has been made for the American or the Bear River, but the cost for these is thought to be less, for the reason that the amount of mining on them is less than on the Yuba.

For the further protection of the Sacramento River the filling up of one of the low districts between the Feather and the American river by its conversion into a storage basin, is suggested. Some parts of this land are represented to lie as much as 20 feet below the banks. The average depth has been estimated at 12 feet. The area is said to be in the neighborhood of 60 square miles. Admitting these statements to be exact, the storage capacity of this basin, filled to the banks, will be about 700,000,000 cubic yards.

It is believed to be practicable to turn the Feather and American rivers into this basin, and make them deposit therein the sands which they bring down. No objection is now seen to turning the American in this way. It is not navigable. The diversion could not fail to be beneficial to the Sacramento.

The Feather differs from the Sacramento in being a larger stream, and consequently likely to be more expensive to divert, and also in being navigable. It is now the outlet for a certain district of country and maintains a small commerce.

It is recommended that a full investigation of this problem be made as soon as possible for future guidance.

The only alternative to these works for arresting the flow of mining *debris* is the entire cessation of hydraulic mining; and even with that heroic remedy it would still be necessary to restrain the many millions of cubic yards of detritus already lying in the path of freshets, which year by year bear down vast quantities of sand and gravel to the destruction of the lower valleys.

Sudden Death from Electric Shock.

A serious illustration of the risk attending electric shocks, even when apparently slight, occurred recently in New Haven, Conn. A gentleman was induced to try a shock "just for fun," from the machine of an itinerant peddler of electricity. He turned away, but had not gone far when he was seen to stagger and fall. He was picked up unconscious, and remained so until he died, two days after. The physicians pronounced it a case of apoplexy, superinduced by the electric shock.

Those Dreadful Moles.

On a visit to the country, a few miles from the city, the other day, we crossed a lawn perforated with holes, and the entire surface so ridged by moles that in walking over it the foot sank deep into the sod at every step. We have never before known these pests to pursue their digging operations through the winter, in this region, and are led to inquire if it is owing to the open winter, or to an increase in the number of these rodents, which has caused the apparent destruction of a cherished lawn. It is discouraging enough to have to contend with these pestiferous diggers from May till November, but now to find them burrowing along the surface in midwinter is an annoyance only the best of natures can cheerfully endure.

Many agricultural writers contend that moles are beneficial to the farm and garden. They may be, but their usefulness is a subject we are not disposed to discuss at this time; but what we would like to know is, what better methods there are for producing mortality among them than the various kinds of traps and other appliances which have been described in these columns. Inventors will find mole annihilators a profitable field for their genius.

Artesian Well at the Fifth Avenue Hotel, New York.

For some time past a drill has been gradually working its way down toward the center of the earth from the basement of the Fifth Avenue Hotel, whose proprietors hope to reach a supply of fresh water for that establishment and avoid having to pay the tax for croton. The well has already reached a depth of more than 1,000 feet, and is deepening at the rate of about 20 feet per day. A *Tribune* reporter called to see the drilling recently, and gives the following account:

Passing through the wide entrance on Twenty-fourth street, where the marketing of the hotel is delivered, and picking his way through a labyrinth of wagons laden with dressed meats, fowls, vegetables, etc., the reporter found himself in front of a partially inclosed space in which the engine, steam pump, and drill were at work. The drill proper, as the engineer explained, consists of a steel pipe, ¼ inch in thickness, 2½ inches in diameter, and about 11 feet long, in the cutting end of which are set fifteen diamonds, ranging in size from one to three and one-half carats. These cut a circle down into the rock, of which the "core" goes into the pipe—to be drawn up when the section is filled. The drill has section after section screwed to it as the depth of the well increases; it is forced downward by hydraulic pressure, and is turned by the engine. Whenever the drill requires examination, or the removal of the core, each section must be unscrewed as it is brought up, and joined again, piece by piece, when the drill is to be lowered for further work. The diamonds become blunted after a certain amount of cutting, and must either be reset or replaced. The durability of the drill varies with the character of the rock which it penetrates. In this well the average wear has been 110 feet, though in one passage of 137 feet, through almost pure quartz, it had to be withdrawn and renewed for every 8 feet passed through. In sandstone the same drill would have endured through about 900 feet.

The core which has been taken from the drill shows the strata of the island; thus far it has been principally of granite and gneiss, with the stratum of quartz referred to. At its present depth the rock is more broken and pebbly, and recently several narrow veins of sandstone have been encountered, so that the immediate prospect seems encouraging.

"There is water down there somewhere," said the engineer in charge, and we intend to keep on down until we reach it, no matter how far we must continue." He then referred to a well in Chicago in which the boring had been continued more than 2,000 feet, and the result had been gratifying.

A Large Block of Sandstone.

At the Dark Hollow stone quarry, near Bedford, O., one of the largest stones ever blasted in this country was "lifted" a week or two ago. The stone is 40 by 50 feet square and about 30 feet thick, and it required 185 slip wedges to make a successful blast. When cut up into pieces it will make nearly 300 car loads of building stone. Immense blocks of stone are frequently taken out of the quarries here which would make the stones in Solomon's Temple mere pebbles in comparison. Its weight was estimated to be about 6,000,000 pounds.

Petroleum for Coughs.

Dr. Moubré, writing to the *Gazette des Hopitaux*, gives his experience of petroleum capsules in simple and chronic bronchitis. This balsamic had been brought before the Therapeutic Society by Dr. Blache a year ago, at the suggestion of a Paris chemist, who named it Gabian oil, in order to prevent public prejudice. Each capsule contains 25 centigrammes of pure petroleum, the ordinary oil not being used, as it has to be distilled in contact with sulphuric acid to render it fit for lighting purposes. At the Hopital Beaujon, where these capsules have been freely ordered for chronic bronchitis, a rapid diminution of the secretion and fits of coughing were observed. In tuberculosis this medicine gave encouraging results.

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AMERICAN INDUSTRIES, No. 40.

OLEOMARGARINE—HOW IT IS MADE.

The wholesomeness of beef fat as an article of food has never been questioned. It is always and unavoidably eaten with beef, however cooked; for the leanest meat not only has more or less fat mechanically attached to it, but also inseparably mixed with the muscular fibers. To insure a liberal incorporation of fat with the lean, our beef is, in one sense, always overfattened. While the lean flesh is receiving the desired admixture of interstitial fat, the animal is overcharged with it, storing up in various parts of its organism masses of clear fat largely in excess of the amount needed for cooking purposes. Until recently this extra fat has been lost to the food supply, being converted by rude processes into inedible though not necessarily unwholesome tallow, to be used in soap making, candle making, for lubricants, and so on.

About a dozen years ago M. Mége, a French chemist, commissioned by his government to investigate certain questions of domestic economy, was led to make a special study of beef fat to see whether a larger portion of it might not be preserved for dietetic uses. The horned cattle of France exceeded twelve millions in number, some millions of them being sent every year to the shambles; and it was obvious that if each were made to yield even a few pounds more of edible fat an enormous and valuable addition would be made to the national food supply. M. Mége began with a comparative study of beef fat and butter. The essential part of the latter, its oil, differs from the oil of suet in containing a percentage of butyric compounds which give to butter a part of its flavor, and in lacking the large proportion of stearine which gives to suet its hardness and rough grain.

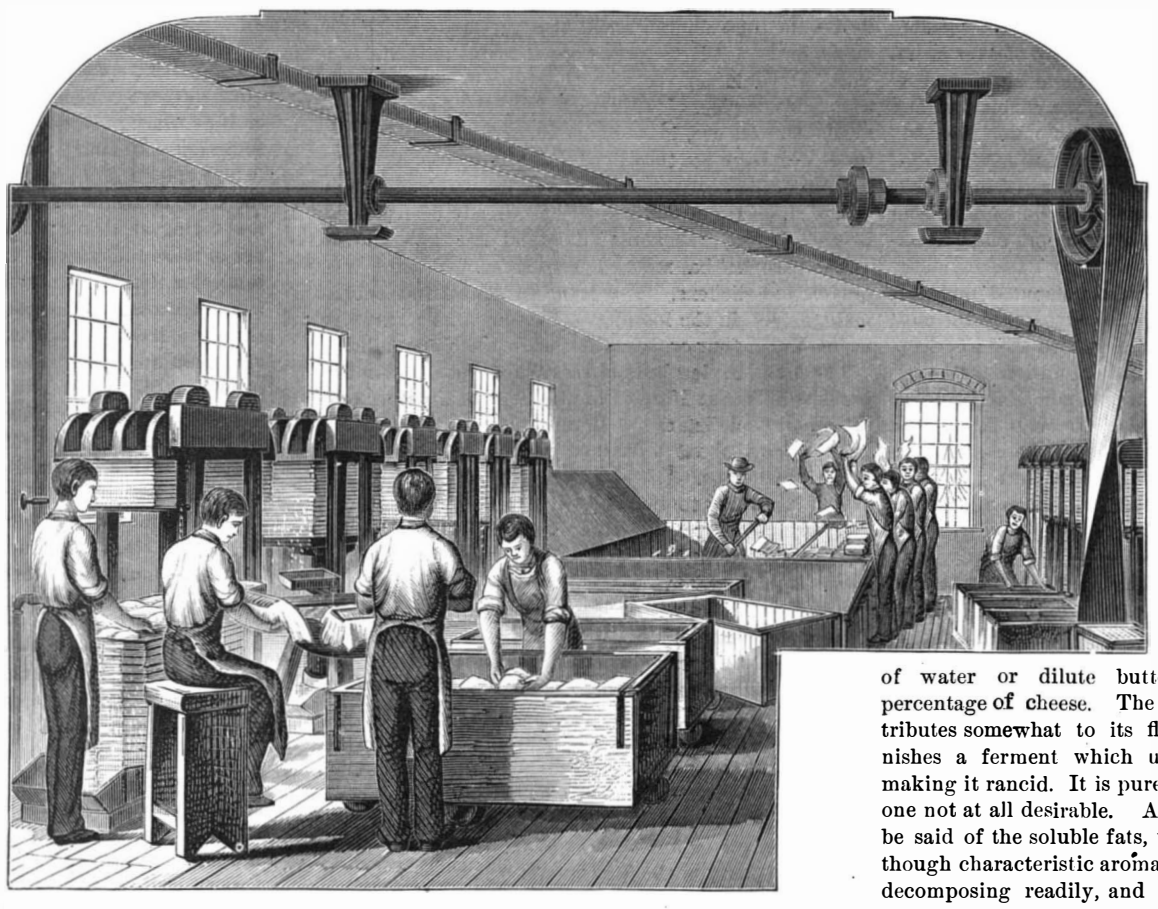


FIG. 5.—PORTION OF PRESS ROOM.

While investigating the origin of butter in the animal economy, M. Mége found that cows, when deprived of food containing fat, still continued to give milk yielding cream. The only possible source of the fat thus exhibited was the stored-up fat of the cow's body. Hence, beef fat could be converted into butter-fat. But how? Physiology taught that the change was wrought in the living organism through the withdrawal of the larger part of the stearine by respiratory combustion; the secretion of the remaining oleomargarine by the milk glands, and its conversion into butyric oleomargarine in the udder under the influence of mammary pepsin.

In the process of making butter by the ordinary method, during the process of churning the cream, the finely divided butter-fat is united in masses containing, by mechanical admixture, from twelve to fourteen per cent of water or dilute buttermilk carrying a fractional percentage of cheese. The latter ingredient of butter contributes somewhat to its flavor, and at the same time furnishes a ferment which ultimately spoils the butter by making it rancid. It is purely an accidental ingredient, and one not at all desirable. And to some extent the same may be said of the soluble fats, which give to butter its variable though characteristic aroma. They are unstable compounds, decomposing readily, and furnishing the acrid products which make so large a portion of the butter of the shops more or less unsavory and unwholesome.

To solve the practical problem set him by the French authorities, namely, to convert the surplus fat of beeves into a savory food product, M. Mége sought to imitate the processes of natural butter making, that is: (1) To separate

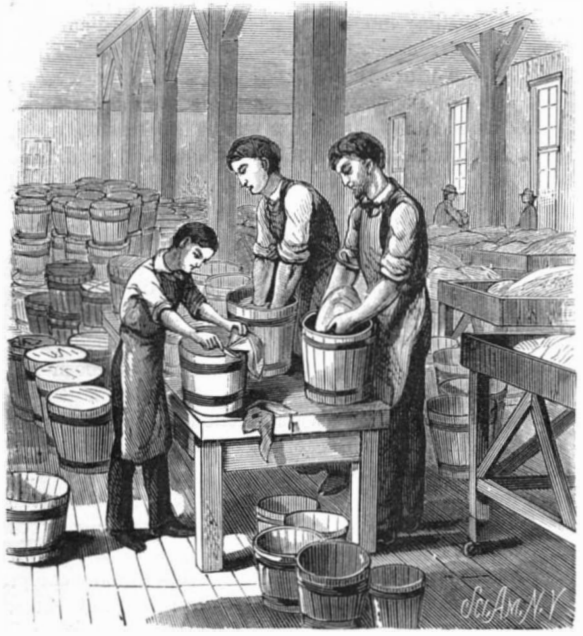


Fig. 9.—PACKING IN FIRKINS.

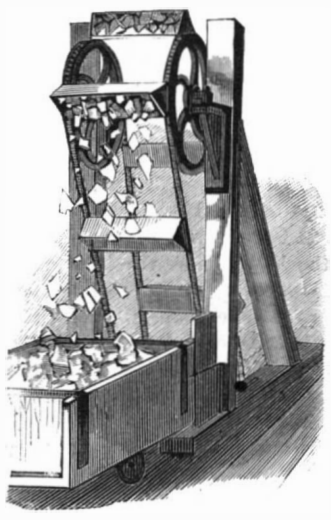
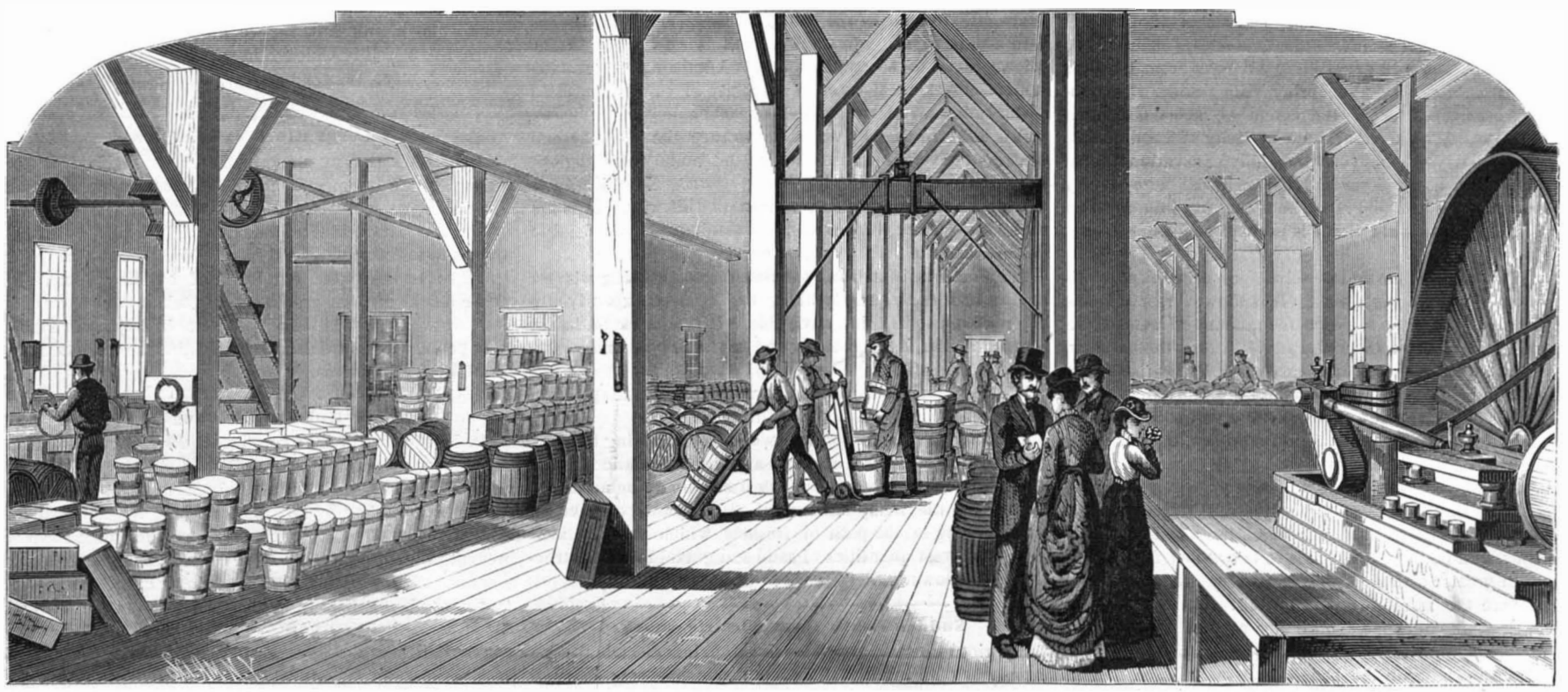


Fig. 7.—ICE ELEVATOR.

Fig. 8.—PACKING FOR THE RETAIL MARKET.



THE MANUFACTURE OF OLEOMARGARINE IN NEW YORK.—FIG. 6.—GENERAL DELIVERY ROOM.

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from the oily fat of suet the cellular tissue and excess of stearine; (2) to add to the oil a sufficient proportion of butyric compounds to give the necessary flavor; (3) to consolidate the butter-fat without grain, and to add, at the same time, the requisite proportion of water, salt, and coloring matter to make a compound substantially the same in composition, flavor, and appearance as butter churned from cream; all this without adding to the original fat anything dietetically objectionable, and without subjecting it to any process capable of impairing its wholesomeness.

The method developed by him in this commendable undertaking can best be appreciated by following it step by step through the extensive works of the Commercial Manufacturing Company of this city, at West 48th street, North River, where it is practiced on a large scale, with such improvements as experience has proved to be advantageous. Our artists' abundant illustrations will make any elaborate description of the several operations quite unnecessary.

At an early hour each morning the selected fat from the several abattoirs about the city begins to come in. The fat being received within a few hours from the time of killing, it is and must necessarily be fresh. After being weighed the fat is thrown piece by piece into large vats of tepid water; any pieces showing blood stains being thrown into a special vat for extra washing. After soaking for an hour in the tepid water, the fat is thoroughly washed with cold water and then covered with fresh cold water and left another hour to soak. It is then assorted. The pieces rich in oil are severed from the rest by a skillful cut, the assorter throwing the finer pieces into an adjoining tank for another washing, and the pieces less rich in oil into tubs to be transferred to the tallow factory. The fat for butter making is now carefully washed a third time, then elevated to the floor above for hashing and melting. The object of hashing is to disintegrate the fat, thoroughly breaking up the tissues so that the oil will separate therefrom at a low temperature. This is necessary to prevent the development of the rank tallowy flavor which results from the action of a heat, such as was heretofore used for the melting of tallow before the Mége discovery.

The hashing machine is simply a series of knife blades revolving in an iron cylinder; the fat being fed in at one end, and, after disintegration, forced out at the other end through a perforated iron plate. From the hashers the fat is conveyed to the melting tanks, a series of caldrons, jacketed and surrounded with water. The water is heated by steam, and in turn heats the fat, which is melted at a temperature of from 122° to 124° Fah. When the fat is thoroughly melted the mechanical stirring is suspended, the particles of membrane settle to the bottom, forming "scrap," and a thin film of white emulsion of water and oil forms on the top. The latter is removed and the clear yellow oil is drawn off into wooden tank cars, which are sent into the "seeding" or press room to rest while the oil is granulating by the crystallization of the stearine. The melting process occupies from two to three hours, and the granulation fully twelve times as long, the temperature of the room being kept at 85° Fah.

The refined fat is next pressed, when the excess of crystallized stearine is removed by straining under pressure. The fat is now packed in cloths set in moulds (as shown in the foreground of Fig. 5) to form packages about the size of a common brick, the packages being placed on galvanized iron plates in the presses on the left. When a press is entirely filled the packages are subjected to a slowly increasing pressure, under which the fluid oil flows out until the stearine cakes are left dry and hard, when they are removed by an adroit flirt of the canvass wrapper, as shown in farther corner of the press room. The larger area of this room is occupied by cans of crystallizing fat.

Two important steps in the butter making process have thus been completed. The thoroughly washed suet has been deprived, first, of the inclosing cellular tissues, and next, of the excess of stearine. We have now a limpid amber-colored oil, perfectly sweet, and substantially the same as the oil of butter. When cooled this oil, or oleomargarine, is slightly yellow in tint, melts in the mouth like butter, and has an agreeable taste. At this stage it furnishes an excellent fat for culinary purposes, and may be kept for a long time without risk of becoming rancid. This makes it much preferable to ordinary butter for naval uses. In the works of the Commercial Manufacturing Company, the larger part of the butter oil formerly did not go beyond this stage, being drawn off from the press room into casks for exportation. At present the company cannot supply the demand for butter.

To convert the butter oil into butter, it is necessary for it to undergo the processes by which fat is converted first into cream and then into butter, in the udder of the cow and in the churn. For this purpose so much of the daily product of the Manufacturing Company as is needed for home consumption is forced through pipes to the churning room. In the cow's udder the fat which is to be converted into cream is divided into minute globules, in other words, emulsionized by the action of the mammary pepsin in the milk. To accomplish the same end in the factory the butter oil is churned with milk for about twenty minutes, when the oil is entirely and minutely broken up. At the same time a small quantity of the solution of annatto is added, as is commonly done in ordinary butter making, to heighten the color of the product. The churning ended, the mixture is withdrawn from the churn into a tub of pounded ice, as shown in Fig. 3. The sudden cooling causes the emulsionized oil to solidify without crystallization. After remaining for two or three hours in contact with the ice, the butter-like oil is worked over by hand and the pieces of ice removed. The product has now the appearance of freshly churned butter, but it is deficient in the soluble butyric elements which give to creamery butter its delightful odor and flavor, and, it must be added, its tendency to become rancid with age. To supply these essential elements of savory table-butter the product is churned a second time with nearly an equal weight of milk, during which process it takes up a sufficient quantity of milk to make it to all intents and purposes the same as dairy butter; not so delightfully fragrant, it is true, as the finer grades of creamery butter, but much more attractive to the senses of taste and smell than the average butter of the shops.

After the second churning the butter undergoes substantially the same operations of working over to press out the excess of milk, salting, packing, etc., as are practiced in our dairies; in these, as in the preceding operations, scrupulous cleanliness being a characteristic feature.

The works of the Commercial Manufacturing Company are three stories high, and cover an area of 22 city lots—about 1½ acres. Our illustrations give some idea of the magnitude of the operations carried on in them. From an average of 100,000 pounds of fresh caul fat received daily, from 40,000 to 50,000 pounds of butter are produced—equivalent to the yield of nearly as many thousand milch cows. From 20 to 25 pounds of beef oil suitable for butter making is obtainable from each of the 12,000 beeves killed every week for the requirements of New York and the adjoining cities: an annual addition to the food supply of this port of not less than 12,000,000 pounds of pure food, having a dietetic as well as a commercial value of from 15 to 20 cents a pound. The possible annual gain to the whole country from Mr. Mége's discovery runs high among the millions.

For those who are curious to know the comparative compositions of natural and artificial butter, the following analyses are appended. It is proper to add that owing to differences in cattle, in their food, and in the common processes of butter-making, natural butter is somewhat variable in composition. The figures given below, however, may be taken as a fair average.

ANALYSIS OF NATURAL AND OLEOMARGARINE BUTTER, BY DR. H. A. MOTT.

Constituents.		No. 1. Natural Butter.	No. 2. Oleomargarine Co. Butter.
Water		11·968	11·203
Butter solids		88·032	88·797
		100·000	100·000
Insol. fats	Olein, Palmitin, Stearine, Arachin, Myristin	51·422	56·29
Sol. fats	Butyrin, Caprion, Caproin, Caprylin	7·432	1·823
		23·824	24·893
Casein		·192	·621
Salt		5·162	5·162
Coloring matter		Trace.	Trace.
		88·032	88·797

The low percentage of the bracketed compounds in artificial butter may be regarded both as a defect and as a merit, inasmuch as they give to natural butter much of its savor and fragrance, and at the same time furnish the elements of its speedy spoiling. Lacking them, oleomargarine butter does not easily become rancid, and is, therefore, pleasanter and more wholesome when long kept.

Considerable misapprehension exists as yet in the public mind regarding the merits of this article as a food product, owing doubtless to its being comparatively new and to the misrepresentations which have been made regarding it. That there are two sides to this, as with most other questions, is evident; thus far only the interests of dairymen have been heard of. Producers of butter urge that oleomargarine injures their profits by preventing high prices for butter. If this be so, it argues good to consumers, whose interests must also be considered.

Another important benefit to consumers is that oleomargarine chiefly interferes with the sale of common grades of butter, to which it is far superior, and it is mainly dealers in this grade of butter who raise an outcry against the new product; although this outcry has been taken advantage of by parties outside of the dairy interest to curry favor with dairymen and serve their own selfish ends.

The complaints of farmers against oleomargarine are unfounded in fact and are kept up only by appeals to unthinking prejudice. Oleomargarine is as much a farm product as beef or butter, and is as wholesome as either. It is as legitimate a commercial product as tallow or lard, which might be as well proscribed as oleomargarine.

The only argument advanced by its opponents which has any validity is that it is sometimes sold as butter; this practice, however, has been greatly exaggerated; wholesale dealers sell it for what it is, and the number of retail dealers who do the same is daily increasing. It should of course be sold as oleomargarine, and the influence of the Commercial Manufacturing Company and of its sales agents, Messrs. Thurber & Co., has been steadily exerted to that end. Apparently some of those who are loudest in their outcry against oleomargarine cannot comprehend that it is better to have it handled openly and above board by such firms, than by irresponsible and unscrupulous parties who might adopt the opposite course and encourage retail dealers to sell it as butter. Oleomargarine is a *fact* in the commercial world and must be treated as such.

RECENT INVENTIONS.

Mr. Charles H. Dederer, of Jersey City, N. J., has patented an improvement in the manufacture of horn buttons. The object of this invention is to utilize a portion of the horn not heretofore used for buttons, to render the buttons more ornamental, to manufacture large horn buttons, and to produce them cheaply.

An improvement in plows, patented by Mr. George Watt, of Richmond, Va., relates to the manner of attaching to the standard of a plow the point and share, the mould board (which may be in two detachable parts), and the sole or wearing piece of the land side. The attachment is effected by means of two bolts and by projections or knobs and hooks, or equivalent devices, which are cast solid with or riveted to the several parts.

An improvement in endless chain horse powers, patented by Mr. Harrison Y. Krauss, of Kraussdale, Pa. It consists in the combination, with the shaft that carries the sprocket wheels and the shaft that carries the belt wheel, of a set of gearing constructed to run the belt wheel in either direction.

Mr. John Baughman, of Indianapolis, Ind, has devised an improved belt tightener for drawing the ends of belts together for lacing or riveting. The invention consists in connecting a tightener with the belt by wedge-shaped cross bars, so that the tightener may be separated from belt by the blow of a hammer, and all screws, stirrups, etc., dispensed with.

Mr. Josephus Craft, of Worthington, Minn., has patented a compound for preserving fresh fruit, composed of bisulphite of calcium and biborate of sodium dissolved in glycerine and sirup.

Mr. Aaron B. Hartman, of Onawa, Iowa, has patented an improved iron fence post which may be made of such materials as may be obtained in nearly every section of the country, and requires no transportation of waste material.

An improved end gate for wagons has been patented by Mr. Jesse S. Howey, of Lexington, Mich. The object of this invention is to facilitate the removal of the end board or gates and coupling rods of wagons.

An improved belt fastener, which is simple in construction and convenient and reliable, has been patented by Hoffman G. Redsecker and John T. Redsecker, of Athens, Ill. The invention consists in a belt fastener, having a curved plate, provided at its opposite ends with internally beveled loops and grooves, in combination with toothed fastening bars.

Machine and hand taps to be used in cutting internal or female screw threads, has been patented by Mr. William Kenworthy, of Brooklyn, N.Y. It consists in a tap having two or more threaded sections, separated by clearance spaces, or spaces without threads, the object being to facilitate the escape of chips from the tap and from the threads being cut.

An improvement in traction engines or road steamers, intended to draw loads on ordinary roads, and to be used for thrashing, corn shelling, wood sawing, and kindred pur purposes, has been patented by Mr. Oliver H. Burdett, of New Athens, O. The object of the invention is to squeeze the dirt between diagonal bars, and leave the face or outside of the wheels clean; also, to give elasticity to the axle frame; also, to hold the boiler securely in place on the engine, and to secure the steam cylinder to the under side of the boiler.

Mr. Henry C. Bowen, of New York, City, has patented a method of determining the temperature of gas retorts and progress of distillation within the same, so as to enable the operator to control the decomposition and secure greater uniformity in the quality of the gas It consists in recording upon a piece of paper or other equivalent material the richness of the gas in carbon by condensing upon the paper, from time to time, spots or surfaces caused by the impact of a jet of the crude gas, which evidence by their depth of color or proportion of carbon, the activity of decomposition, and correlatively the heat of the retort, so that the latter may be controlled in temperature to secure uniformity in the product.

MACADAMIZED roads were never intended for the metropolis and for large towns, and in such places we must hope that their days are numbered. For constant and heavy traffic combined with high speed, as it occurs in all important towns, a macadamized road becomes a nuisance; it requires everlasting repairs, and consequent stoppage of the traffic; it damages and wears out the better class of vehicles passing over it to an alarming extent; and is dirty, unwholesome, and unpleasant in all weathers.—(Inaugural Address of Joseph Bernays, delivered before the Society of Engineers.)

TRANSPLANTING THE TULIP TREE.—The *Rural New Yorker* states, from trials, that young tulip trees may be easily and safely removed by cutting back the entire stem within two or three inches of the neck, leaving only neck and roots to be set out. Hundreds of trees thus treated mostly grew vigorously, sending up from near the roots new and straight stems.

A FEW years ago Mr. Gideon Bantz, of Frederick, Md., invented what he terms a "fold-skin leather," which he has manufactured successfully during the past five years. The chief advantages of Mr. Bantz's leather consists in its waterproof and enduring qualities, which render it specially useful for hunters, fishermen, coachmen, and others, whose occupation exposes them to the weather.

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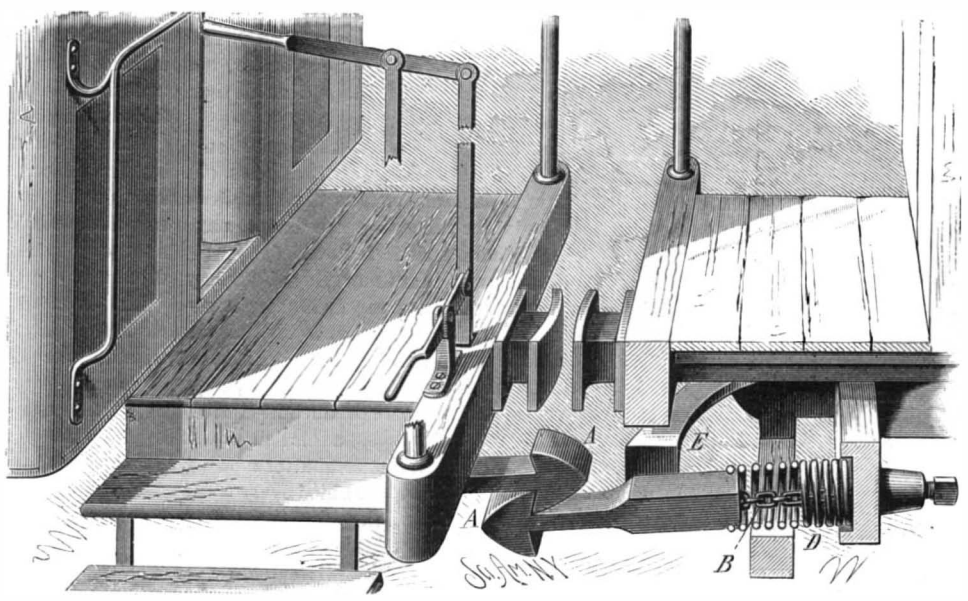
NEW CAR COUPLING.

The annexed engraving represents an improved car coupler recently patented by Mr. Alexander Peck, of Farmingdale, Ill. It is capable of automatically coupling cars of unequal heights, and is operative in such cases as commonly require a bent link, at the same time it is a safe and convenient coupler for cars of any kind. The couplers, A, are provided with arrow-shaped heads, whose interlocking faces are beveled, so that when coupled and drawing they cannot slip apart and become uncoupled so long as the cars keep the track. A chain, B, connects the coupler with the draw bar, and is surrounded by a spiral spring which holds the coupler in a horizontal position except when engaged by another coupler; it then yields sufficiently to admit of coupling two cars of the same height or of different heights within wide limits. Each coupler is provided with a lever arrangement, by which it may be raised to uncouple it or to bring it into the proper position to be engaged by the opposing coupling, when the cars being coupled happen to be of exactly the same height.

The inventor states that this coupling is safe and effective, and may be readily applied to ordinary cars without any material alteration and without the removal of their buffers. Its construction is such that should any of the cars leave the track they immediately become uncoupled and leave the rest of the train. The advantages of this coupling will be readily understood by persons familiar with the requirements of railroad engineers.



PECK'S CAR COUPLING.

AUTOMATIC HUB MORTISING MACHINE.

The annexed engraving represents an automatic double chisel hub mortising machine, manufactured by the Defiance Machine Works, Defiance, Ohio. This machine is automatic in all its movements, it will make stagger mortises as well as straight, and will mortise hubs from three and one half inches up to thirteen inches in diameter. It is adapted to a wide range of work, and is very strong and well built, and although the engraving makes it appear rather complicated it is in reality more simple than the ordinary single chisel machine.

The chisel bars in this machine are inclined at the proper angle, and are both driven by a single crank shaft. Their lower ends are run in slides so that all springing is avoided and the work is done with accuracy.

The hub is carried up to the chisels by a cam seen underneath the bed, and the auger which bores the hub previous to mortising is brought into action at right angles to the chisels.

The auger spindle will be seen in the engraving projecting through the standard just above the bed.

This machine is no experiment, it having been in practical operation for more than ten years, giving the best of satisfaction. It is capable of beating 7,000 $1\frac{3}{16} \times 2\frac{1}{4}$ mortises in ten hours without fatiguing the operator.

The manufacturers inform us that the double crank, chisel bars, auger-spindle, the pins, and the shafts are all made of steel. Everything about the machine is calculated for heavy and continuous work.

Further information may be obtained from the manufacturers, whose address is given above.

Fire by Friction.

A company of South African savages, Zulus, are now amusing the people of London, at the Westminster Aquarium. Among other performances they show how they get fire without matches. Some straw being laid on the ground as a bed, two sticks were placed on it a few inches apart to form a support for the third stick, which was laid across them, having a deep notch cut in it to receive the blunt point of the drilling stick; this was twirled like a chocolate muller between the palms of the hands, and when the twirler's hands reached the bottom they were either dexterously shifted to the top again, or another of the Africans squatting round took on and relieved the first. A spark was got in the charred dust in about five minutes, and was received with shouts and leaps of delight by the fire makers, one of whom, carefully shielding it in a handful of the straw, soon fanned it into a flame.

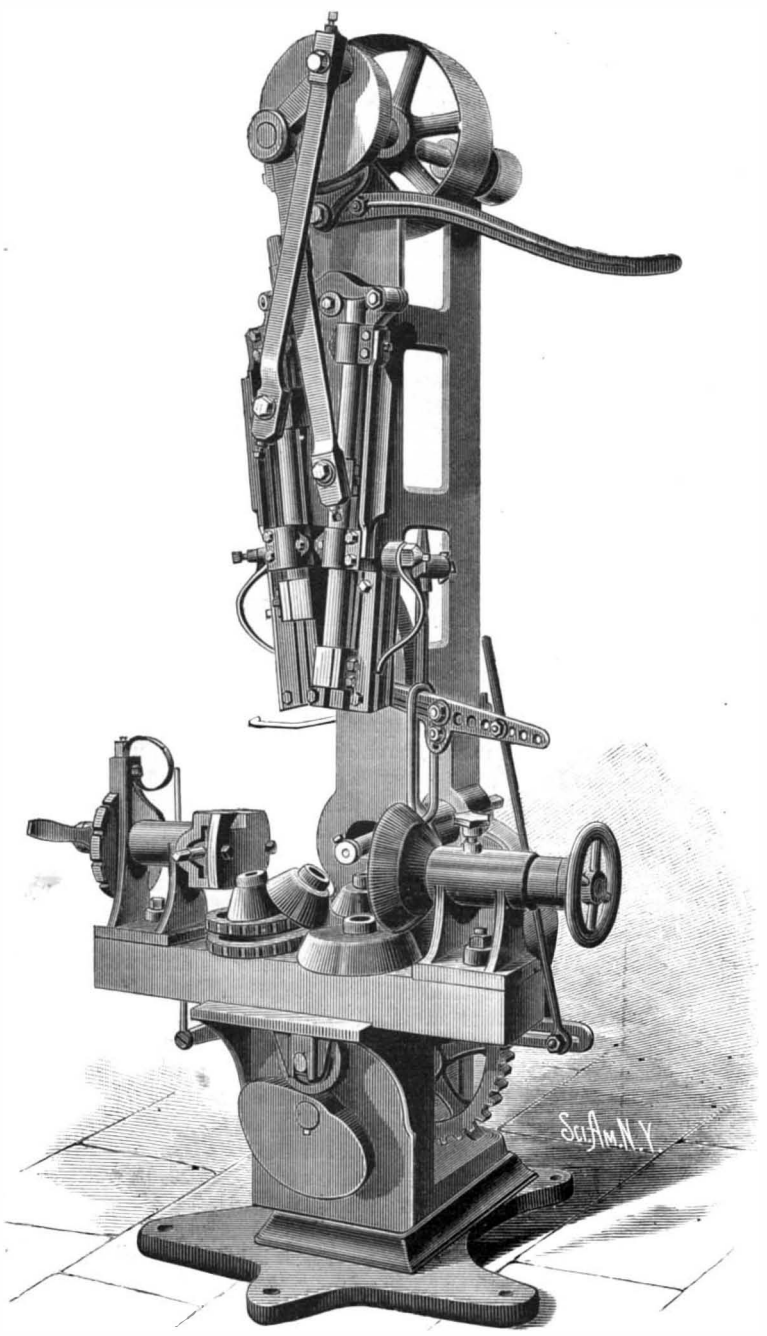
MISCELLANEOUS INVENTIONS.

Mr. William H. Mintzer, of Colton, Cal., has patented a shoe for locomotive engineers, firemen, drivers of horse cars, and others, by the use of which they will avoid the pain and diseases that they are subject to because of the jarring of the cars.

Mr. John M. Ludwig, of Edenburg, Va., has patented an improvement in the class of middlings purifiers in which the middlings are delivered upon a horizontal reciprocating screen. This is a simple and economical middlings purifier by which a large percentage of a high grade family flour may be obtained. The machine occupies small space, and may be run with less power than an ordinary grain separator.

Mr. William E. Woodruff, Jr., of Little Rock, Ark., has patented a machine for printing addresses on newspapers, pamphlets, wrappers, envelopes, etc., from movable, consecutive, and connected forms or printing surfaces.

Mr. Thomas Soden, of New York city, has lately patented a novel bed lounge. The improvements relate to the arrangements for transforming the lounge into a bed.



DOUBLE-CHISEL AUTOMATIC HUB MORTISING MACHINE.

A novel game apparatus, patented by Mr. William B. Cowan, of Guelph, Ontario, Canada, relates to games for parlor amusement; and it consists in combining with outside walls and wings, other walls with end wings, and an armed extension inclosing a space opposite a V-shaped projection. This invention cannot be clearly described without engravings.

An improved stock car has recently been patented by Mr. John L. Copp, of Rochester, N. H. The object of this invention is to furnish stock cars so constructed that the stock can be conveniently fed and watered without being removed from the car.

Mr. William Freeland, of Brooklyn, N. Y., has patented a simple, durable, and safe device for securing carriage traces to the whiffletree, especially adapted to light harness having slotted leather traces, and it consists in a slotted pin fitted with a spring blocking piece, which is normally projected by the spring to retain the trace, and when depressed closes within the pin and flush with its surface.

Messrs. Joseph W. Cole and Columbus M. Cole, of Warren county, Ky., have patented an improvement in the class of machines for extracting honey from the comb by the effect of centrifugal action. The inventors of this machine have aimed at the greatest simplicity, and have provided for the convenient insertion and removal of the comb, for supporting comb of any any size without the aid of a supplemental device, and for reception of the extracted honey into cups or buckets, which are made detachable for the purpose of enabling them to be removed when filled and replaced by empty ones.

Mr. Enoch B. Norton, of Hartford, N. Y., has invented an apparatus for sprinkling Paris green liquid on plants attacked by insects, the object whereof is to enable the liquid to be carried conveniently in a suitable vessel, and to permit the quantity of liquid delivered and the direction in which it is sprinkled to be promptly regulated by the operator.

An improved rocking chair, which is so constructed that it may be adjusted for use as a reclining chair, and may be compactly folded for storage and transportation, has been patented by Mr. Chauncey D. Hyde, of Pitcher, N. Y.

Mr. Cyrus Norwood, of Winters, Cal., has patented an improved electric or galvanic belt to be worn upon the person for the purpose of allaying pain and preventing and curing various forms of disease.

Mr. Jordan H. Mitchell, of Eufaula, Ala., has patented an improved buckle for connecting the ends of bale ties or bands; and the object of the invention is to furnish a buckle which shall hold the tie securely and can be used without the necessity of perforating or cutting the tie or band.

An improved end gate for wagons has been patented by Mr. George Jontz, of Wyanet, Ill. The object of this invention is to furnish end boards and top boxes for wagon bodies so constructed that the end board may be adjusted for use as a shoveling board and a dumping board.

Mr. Richard Young, of Brooklyn, N. Y., has invented a tool for ornamenting and finishing the surface of leather, which consists in a creaser or marker, such as is used for lining, and a roller for embossing and printing, the creaser being stationary, while the roller is fitted to revolve, so that in use a line or crease and a printed impression are produced at the same time. The tool is used in connection with a drum, hand jigger, or other machine of usual character for finishing leather.

An improved saddletree fork has recently been patented by Mr. Gustav A. Mittendorf, of New Braunfels, Texas. The object of the invention is to strengthen the iron fork by means of a bent wooden part.

Mr. Joseph Kintz, of West Meriden, Conn., has patented an improved drop handle for drawers, etc. The object of the invention is to prevent the knob from swinging in any but a vertical plane to and from the drawer, and the lapped portion from straightening out.

A lamp base, made of glass or porcelain, provided with two rings adapted to fit on the body of the base, and having two handles, each of which is attached to both of the rings, has been patented by Mr. Joseph Kintz, of West Meriden, Conn.

Mr. George W. Bolton, of Fredericksburg, Iowa, has patented a milk can provided with simple and efficient devices for cooling and gauging the milk and for removing the cream.

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A NEW WRITING INSTRUMENT.

No one using an ordinary pen constantly, or even for any considerable portion of the time, can fail to feel the want of something better adapted to ordinary writing than steel or gold pens. The constant dipping, which not only takes time, but is fatiguing; the liability to blotting, and in the case of steel pens, their failure soon after they get into good condition for use, are all serious objections which existed from the first days of pens and ink until the invention of the complete little instrument shown in the annexed engravings. Fig. 1 shows the MacKinnon fountain pen in actual use; Fig. 2 is a sectional view showing the internal construction; and Fig. 3 shows the pen about to be closed to be carried in the pocket or laid upon the desk. In general outline it resembles many of the penholders or pencils now in use. The handle is a tube which holds ordinary writing or copying ink. The writing point is conical and terminates in a graceful tube of gold, tipped with iridium, polished smooth as glass. Through a fine aperture drilled through the iridium on the point, the ink flows at the slightest touch on any surface, and it is so constructed that as soon as the pressure of writing is removed, the ink instantly ceases to flow.

Fig. 3.—THE MACKINNON PEN.

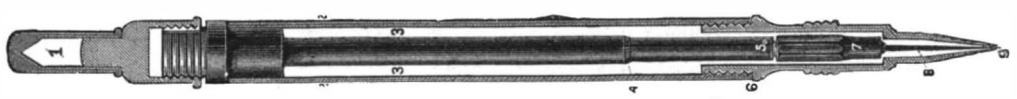


Fig. 2.—SECTIONAL VIEW OF THE MACKINNON PEN.

1. Reversible Point Cover on Air Cap.—2. Walls of Ink Tube.—3 Ink Tube.—4. Air Chamber.—5 Air Vent.—6. Ink Joint. 7 and 8. Valve and Swivel Needle.—9. Diamond Writing Point.—The Point Section includes the whole Section from 6 to 9.

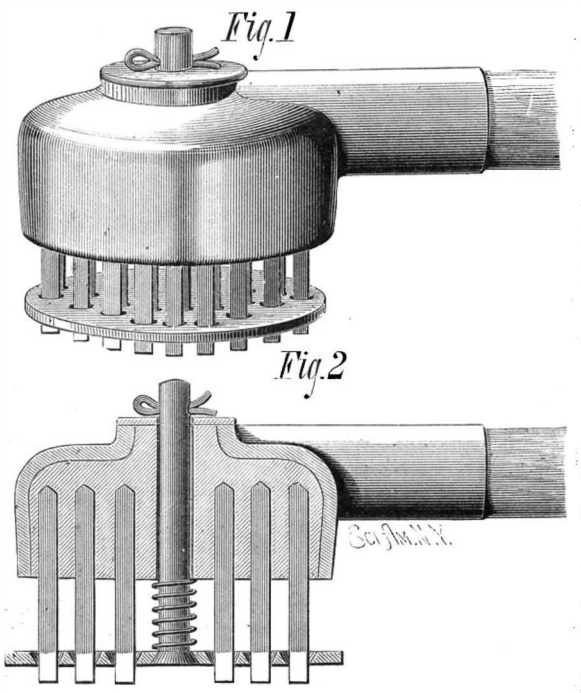
With one filling this pen is capable of writing from seventy to eighty pages of foolscap. It can never blot, and when not in use it is closed perfectly tight, so that the ink cannot thicken or dry. Any good ink may be used, and the ink reservoir is readily filled by means of a small glass filler accompanying each pen. The MacKinnon pen is not only of the greatest service to those who write continuously, but it is a very necessary article for canvassers and others who desire to make a permanent record, and to whom it is a serious inconvenience to carry the ordinary writing materials.

This pen has several advantages over its competitors, the most important of which are: The improved valve, which is operated by a weight instead of spring, making its action more reliable and rendering it less likely to get out of order. The writing point is a circle of iridium, one of the hardest of substances known, and is perforated with a fine tapering hole, through which the ink flows in writing. The patent for perforating iridium is controlled by the MacKinnon Pen Company, 200 Broadway, New York, and is applied exclusively to their make of pens.

These pens have been in use in the SCIENTIFIC AMERICAN office for over a year, and have given good satisfaction.

NEW STEAK-TENDERING MALLET.

The engraving represents an implement that will be appreciated by our readers, all of whom, without doubt, are lovers of wholesome and nutritious food. The palatableness of food lies not altogether in the cooking although cooking is often justly blamed for a poor dish. This is especially true of steaks. Good cookery can never make a tough steak tender, but it is possible, by the proper treatment, to prepare a steak of medium quality so that it may be served up as tender and juicy as the best cuts. This cannot be done by pounding it with rough or serrated hammers, but it may be accomplished by making innumerable incisions with a sharp instrument, which will sever the fibers without affecting the general appearance of the steak. Such an instrument is shown in the engraving, Fig. 1 being a perspective view, and Fig. 2 a central section showing the details of construction.



STEPHENS' STEAK-TENDERING MALLET.

Thirty-six chisel-edged steel teeth or knives are inserted in the head, and a perforated plate sliding on the knives and forced outward by a spiral spring serves as a cleaner, preventing the meat from adhering to the knives as the blow is given.

A steak treated with this instrument is rendered very tender and may be quickly cooked. A round or a shoulder may be made as tender as a porterhouse steak. It is stated that its effect on a veal cutlet is remarkable. We understand that this useful invention is meeting with a large and increasing sale.

Further information may be obtained by addressing the patentee, Mr. C. T. Stephens, Ithaca, N. Y.

MECHANICAL INVENTIONS.

An improved spoke tenoning machine, patented by Mr. Tarrence Connor, of Leavenworth, Ind., is adapted for attachment to the spokes, and fitted with cutting devices for reducing the ends of the spokes to the required size for entering the mortises of the fellies. It is simple, light, and convenient.

Mr. Joshua W. Jones, of Harrisburg, Pa., has patented improved attachments for hydraulic presses, so constructed as to close the outlet valve automatically when the follower has been run back to a fixed point, and to sound an alarm when the desired pressure has been attained.

An improved harness pipe loop attachment for wax thread sewing machines, has been patented by Mr. David M. Lewis, of Memphis, Tenn. The sewing of pipe loops by hand is slow and tedious work, and greatly increases the cost of the harness; but with this attachment it is said that such work will cost less and be stronger. It can be used on lower grades of harness, and will improve their looks and increase their market value.

An improved feed and gig mechanism for the carriage of circular saw mills has been patented by Mr. James H. Watson, of Tawas City, Mich. The invention consists in a combination of mechanism which cannot be clearly described without engravings.

An apparatus for illustrating the rules of perspective drawing, so that a teacher by its use can prove to his pupils the correctness of the diagrams made in accordance with the rules, has been patented by Mr. Frank O'Ryan, of New York city.

Mr. Isaac D. Beach, Jr., of Millersville, Mo., has lately patented a simple and efficient device for securing nuts upon bolts so that they cannot be jarred or shaken off.

Messrs. John Henderson, Jeremiah H. Henderson, and Justin Notson, of Leon, Iowa, have patented a churn by means of which large and small quantities of butter can be produced, as may be desired, and which is easily operated and is simple in its parts. It consists of the arrangement of two dashers, which are operated by means of two disks provided with pins that take in the slotted shafts of the dashers, these disks being fastened to the end of a horizontal shaft, which is rotated by means of a crank and bevel gearing.

Mr. Angus McKellar, of Fort Douglas, Utah Ter., has patented a simple device for drawing up the metallic skeins on an axle and holding them tightly in place as they become loose from the shrinkage of the wooden axle.

THE MACKINNON PEN OR FLUID PENCIL.

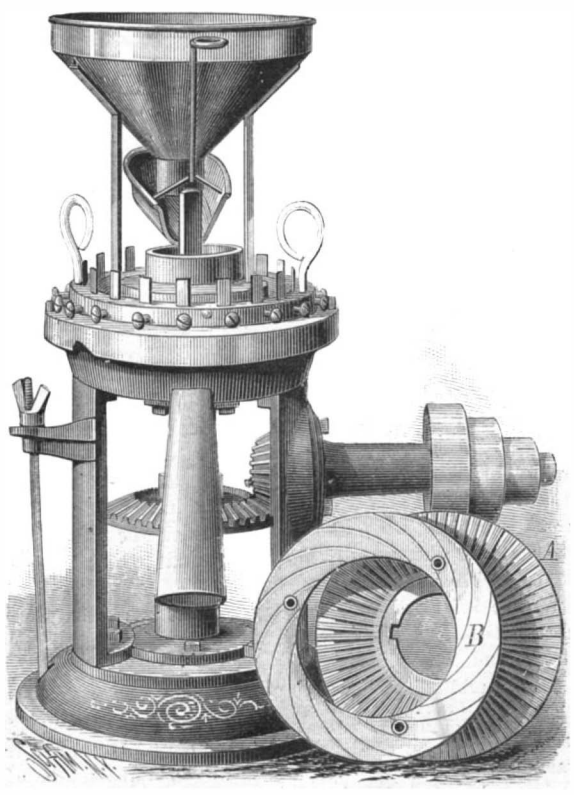
NEW OATMEAL MACHINE.

The mill shown in the annexed engraving is designed for granulating or cutting grain, such as oats, wheat, or barley. It is the invention of Mr. William Eberhard, of Akron, O., and is the outcome of practical experience in oatmeal milling. It is simple and efficient, and is giving good satisfaction where it has been introduced. The oats, which are fed in through the hopper, are carried outward by centrifugal force in the grooves in the rotating plate shown in detail at A, and are brought against a series of stationary knives arranged around the edge of the rotating disk. The outward motion of the grain is insured mainly by the radial grooves in the plate, A, but any tendency to clog is prevented by a series of spiral grooves in the cap, shown in detail at B.

The knives can be removed from the machine while it is in motion. The plates which carry the grain are made of chilled iron nicely polished. The machine is capable of being adjusted to different kinds of grain by changing these plates, three sizes of which are furnished with each machine. The inventor informs us that an eight inch plate machine will cut from twenty to thirty barrels of meal per day.

This machine is built on correct principles and seems very simple and practical.

Further information will be furnished by the inventor, who may be addressed as above.



EBERHARD'S OATMEAL MACHINE.

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BOILER PLATE TESTING MACHINE.

The engraving represents a testing machine recently built by Messrs. E. & T. Fairbanks & Co. for the United States Government, and placed in the office of the U. S. Steamboat Inspectors in the Post Office building in New York city. It is designed for testing the tensile strength of boiler iron, and has a capacity of 75,000 lb.

The weighing apparatus is a regular platform scale, and may be tested with standard weights to prove its accuracy the same as the ordinary platform scale. The strain is applied to the specimen of boiler plate by means of two screws and worm gears worked by a large gear wheel and a small pinion. By this arrangement of gears a man can easily apply 75,000 lb. strain with one hand.

The main beam, A, of the scale carries a poise or weight, B, which moves on rollers and may be run out to 75,000 lb. The light beam, C, has a finer graduation on it running up to 6,000 lb. The poise, D, on this beam, is moved automatically by an arrangement of clockwork, E, attached to the end of the beam.

The platform of the scale, K, rests on four knife edges in the main levers, F, one at each corner of the scale. These levers connect with the double lever, G, through which the strain is transmitted to the lever, H, and then through the lever, J, to the steelyard rod of the scale and by that to the beam, A.

The two columns, L L, with the cross-head and upper clamp, M, rest on the platform of the scale. The lower clamp, N, is secured to the cross-head, P, which is worked up or down by the two screws, R R, turned by worm gears S S, on their lower ends, which receive their motion from worms on the shaft carrying the gear wheel, T.

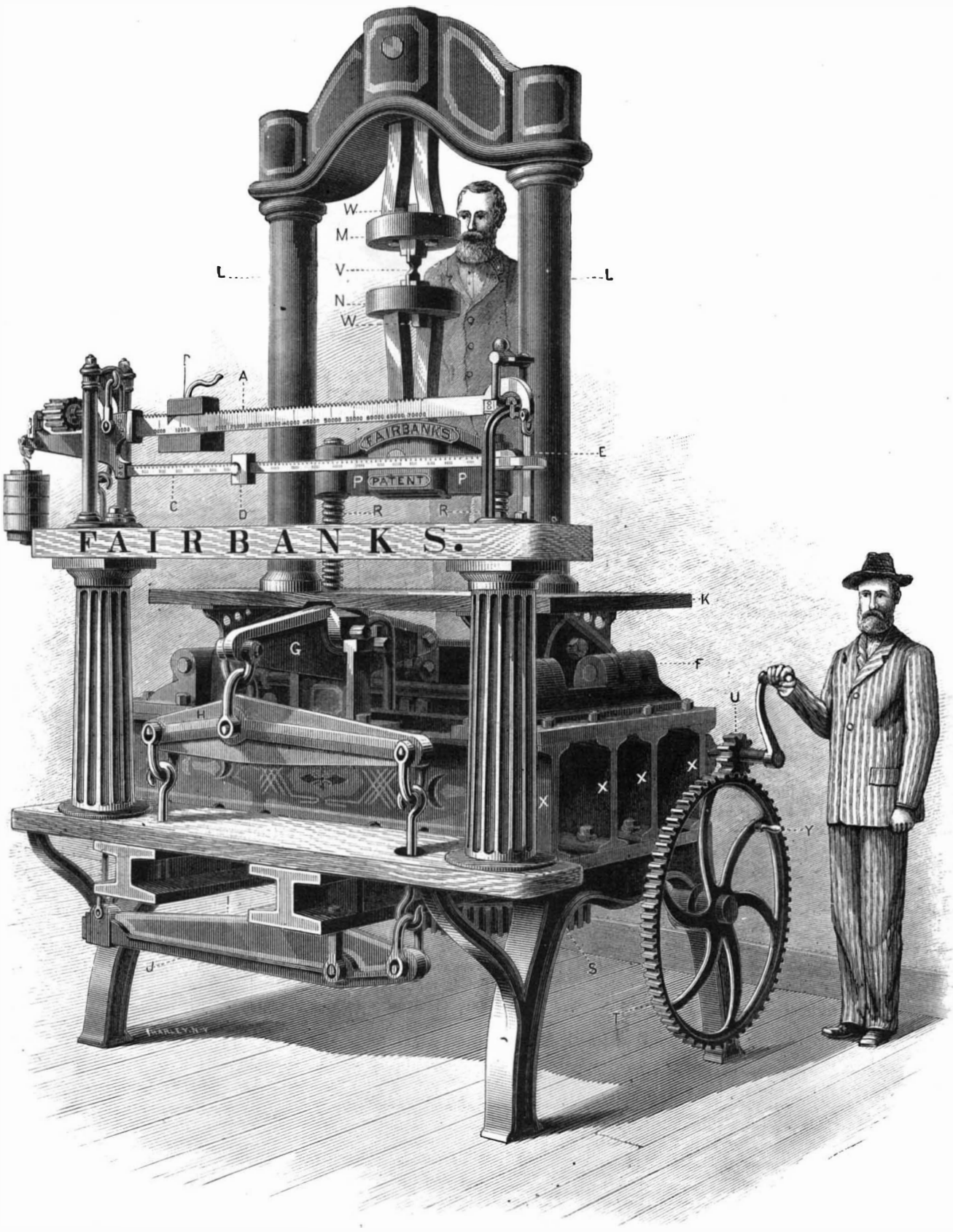
To make a test, the specimen, V, of iron to be tested is secured in the clamps, M N, by steel wedges, W W. When this is done the specimen is the only connection between the screws and gearing and the platform of the scale.

To begin the test the pinion, U, is shipped out of gear, and the gearing and screws are turned by the handle, Y, until a slight strain is applied to the specimen, when the pinion, U, is shipped into gear. As the strain on the specimen increases the beam of the scale rises, causing the automatic poise, D, to move along on the beam until it reaches the point equal to the strain applied to the specimen, when the beam drops and the poise instantly stops. This operation is continued until the specimen is broken, when the point at which the poise stands will indicate the exact number of pounds which were required to break the specimen.

We are informed that the Government has ordered two more of these machines, which are now on their way to Cincinnati and San Francisco.

This machine is believed to possess many advantages over other testing machines; its accuracy can be determined by actual test, the same as would be applied to any platform scale, and by the use of screws and worm gears, a steady strain can be applied and maintained for any length of time.

Machines on the same general principle as the one here represented, but changed in minor features to accommodate different test work, are also manufactured by Messrs. E. & T. Fairbanks & Co., whose office is at 311 Broadway, New York.



BOILER PLATE TESTING MACHINE.

Assyrian Vases.

The Museum of the Louvre, Paris, has just acquired two vases of large size, and of the utmost importance from the scientific point of view. They are two Etruscan vases of the earliest period, with paintings in white on a red ground. On one is seen a chariot attacked by a lion—a manifest imitation of Assyrian art—and a naval engagement between two very singularly shaped vessels. The other shows two lions rampant in the Asiatic style, and two Greek myths—the birth of Athena and the boar hunt of Calydon. It likewise bears an Etruscan inscription, one of the most ancient known. The representations of Hellenic fables had not been previously noticed on remains of Etruscan painted pottery of such early date, for the two vases may be confidently attributed to the eighth or the seventh century B.C.

The Bulwer Standard Mill.

This magnificent quartz mill consists of thirty stamps, and is built after the most approved plan. The ore will be run from the tunnel direct to the ore house, into two large bins, where it will be broken and screened, falling into the main body of the ore house that is connected with the batteries by automatic feeders, self-adjustable. These feeders are a model of mechanical ingenuity and well worth a visit. There are two distinct batteries of fifteen stamps, parallel with each other, working from pulleys on the same shaft placed on a center shaft between the batteries. The capacity of the batteries is about one hundred tons a day, depending on the character of the rock. The slum tanks are ranged on each side of the amalgamating room and are supplied with centrifugal pumps, and hose to charge the pans. The pulp is carried from the batteries to the slum tanks in sluice boxes, with openings over each tank to fill them, requiring but one man on each side to fill the tanks and charge the pans. The pans are set parallel with each line of slum tanks, and are furnished with a patent steam quicksilver pump. This pump saves handling of the quicksilver when cleaning up or charging the pans. Between the lines of pans is one open passageway, giving plenty of room for working purposes. The engine that drives this mass of machinery is a 225 horse power poppet valve, set in a parlor adjoining the amalgamating room. It works as smoothly and easily as a noiseless sewing machine, and is a splendid piece of mechanism, fitted up with the latest improvements, and handles the mill machinery with ease. The boiler room adjoining the engine room is large and spacious, with two sets of boilers, the steam drums as large as boilers for ordinary use. One of the boiler furnaces is built after the old style, the other set is fitted up with Box's patent fuel-saving furnace. It is claimed to save one eighth of the wood to do the same work as the old style of furnace. They are in use at the Justice mine, Gold Hill, and have been for the past eighteen months, and no doubt its competitor by its side will soon be replaced by the Box patent. The arrangement of this furnace, or its novelty in patent parlance, is the partition fire wall that extends close to the boilers, an arched opening being left on a level with the grate bars for draught, and extending back to an overhanging wall. The grate bars are set at an angle, and the coals from the furnace form a bed between the partition and the rear hanging wall; the draught carries the flames, gases, etc., over this bed of coals, a great heat being generated, igniting the gases and utilizing the heat for steam purposes; that with the old style of furnace passed away and up the smoke stack without igniting.

It strikes us as being a valuable invention, and one that must make a great saving in wood, and to mills or mines using large quantities this should be a material object. Bodie can now boast of one hundred and fourteen stamps in active operation, and in a few days ten more at the Spaulding mill will be started, when one hundred and twenty-four stamps will be crushing away day and night. This will more than double the former yield of bullion from Bodie.—*Bodie News.*

DR. AUERBACH, writing to the *Chemiker-Zeitung*, mentions as a curious fact that during an entire summer he observed water beetles—probably *Gyrinus natator*—living in tanks of a saturated solution of Glauber salt. When alarmed the beetles took shelter under the crystals, just as they do in ordinary circumstances under water plants. A little of the liquid so harmless to insects, having found its way by leakage into an adjoining river, proved fatal to multitudes of fish.

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THE ELEPHANT CALF AND ITS MOTHER.

We present herewith a portrait of the elephant calf, whose birth in Philadelphia was noticed a few weeks ago. The event, from its rarity, has naturally awakened considerable scientific interest. It has afforded for the examination of our naturalists a full term placenta, and has also furnished evidence confirming the reports of trustworthy observers touching the period of gestation in the elephant (about twenty and a half months), the mode of suckling by the calf, etc. Contrary to newspaper reports the breeding of elephants in captivity is no novelty in itself; though from the limited number of elephants known in this country until within a few years, and the unfavorable conditions under which these few have been kept, it is not at all surprising that this birth should be the first on record here.

Heretofore the elephant has been classed as belonging to the pachydermata, but Professor Henry C. Chapman, Professor of Physiology in Jefferson Medical College, in a paper on the placenta of the mother, Hebe, is disposed to convert this theory and classify it with the rodents. He grotesquely characterizes it as a "great big mouse." What are his grounds for this new classification remains to be seen on the publication of his paper, of which we have as yet only a meager report in the Philadelphia *Press*. The heart of the elephant is well known to resemble that of the rodent, and the bones to correspond with those of the human being, which the elephant resembles in other particulars.

The calf, of which we give an engraving, is, as previously noted, the offspring of two Ceylon elephants said to have been imported by Barnum in 1865. Mandrie, the father, is 26 years old and weighs about 8,000 lb. Hebe, the mother, is 23 years old and weighs 7,020 lb. From the time of their landing in this country they have shown a special attachment for each other. The female is noted for her uniform docility and gentleness, and the father for his beauty of form.

Mandrie and all the other elephants belonging to the circus seemed fully aware of the condition of the mother for months before her delivery; and afterwards both calf and father seemed to recognize the relationship existing between them, manifesting the same by various unmistakable signs.

The birth of the calf was the occasion of much excitement among the other members of the herd, whose trumpeting disturbed the lions and tigers in the adjoining house, causing them to roar in chorus.

Hebe became greatly alarmed, and, with a huge effort, parted both the great chains to which her hind feet were fastened to the stakes. The watchman fled for his life. On his return with several assistants they found Hebe rolling the little one over and over on the ground, and yelling violently.

Fearing that, in her excitement, she might kill her young one, the men endeavored to take it from her, but at that she seized it with her trunk, and tossed it across the ring, where it fell under a heavy railing surrounding a large stove. In an instant she had followed it. Finding the railing in her way she struck it down and tore it into splinters.

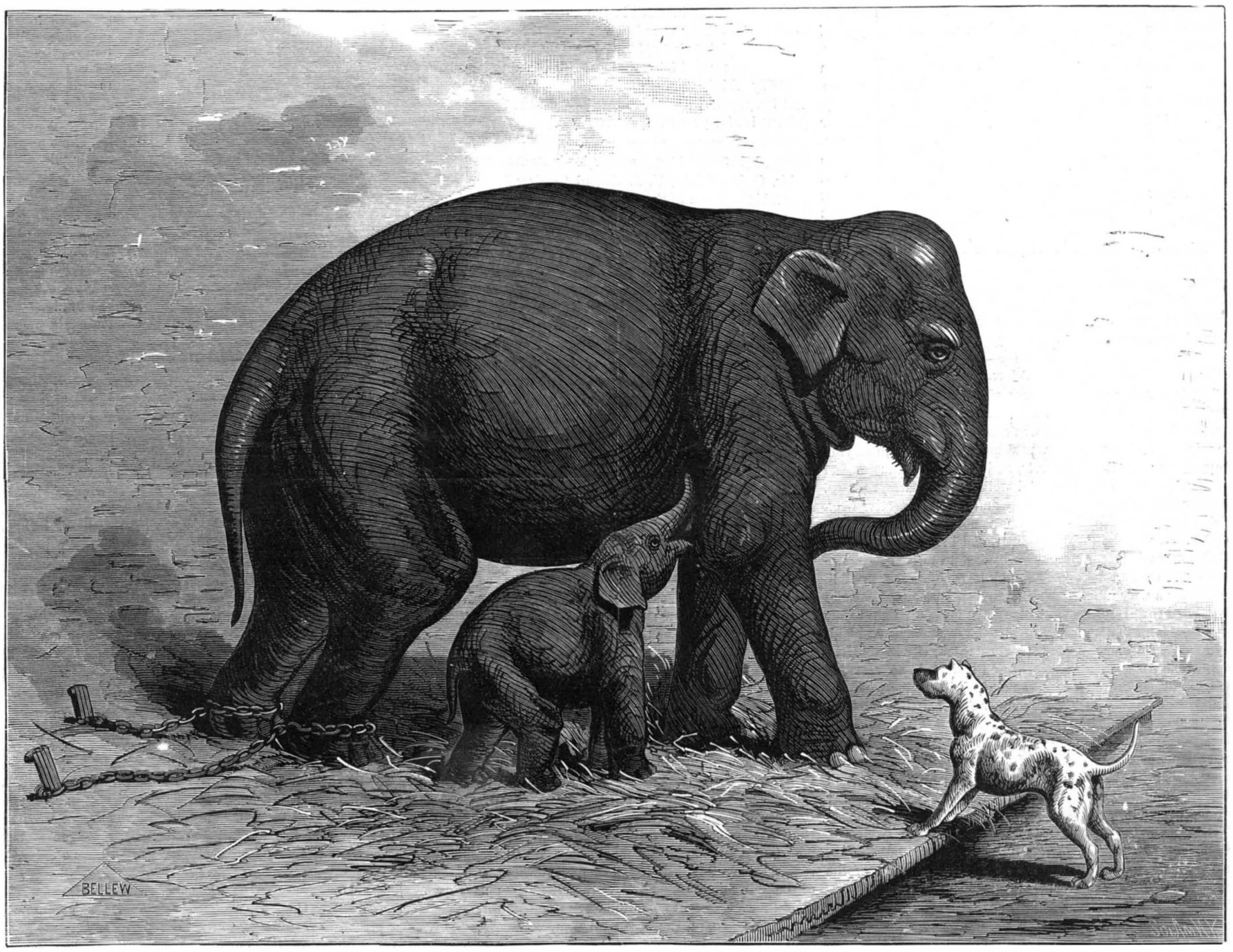
It is now believed that she had become alarmed by the roaring of the lions and tigers, and was trying to get it over to where the other elephants were chained and so secure their protection.

After a little time the keepers managed to calm the mother, and she allowed herself to be led back and rechained, but not for an instant would she permit the little one to go beyond the reach of her trunk. The calf was not at all injured by her rough usage.

For some time the mother continued so nervous and restless as to prevent the young one from suckling, in which dilemma the keeper hit on the device of constructing a kind of huge nursing bottle out of a yard of rubber tube and a funnel. One end of the tube was inserted into the mouth of the calf, while to the other end was attached the funnel, into which the mother was milked. The calf now suckles in the natural way, and not with the trunk as was supposed by Buffon and Aristotle. The udder, which is situated between the two fore legs, consists of two lobes with one teat each, like the breast of a woman. The teats project outwards, making them more accessible to the calf, which, as it sucks, presses the udder with its little trunk, while the mother slightly advances, and raises the leg on the side in use. Sometimes the mother will wind her trunk between the two fore legs towards her udder, either for the purpose of pressing it as women do with their breast, or in order to caress her calf. The little one suckles frequently, and seems to take great pleasure in walking under the mother's body, or in sprawling on its side among its parent's huge feet.

In appearance the calf is very like the mother, in shape, and color, and movement, but the eyes seem larger in proportion, and are rendered conspicuous by a line of pinkish hue round the lids. It has also a thin mat of black hair on the top of its head much resembling that on some human babies. It has, too, a decidedly infantile expression, remotely suggestive of a sucking pig.

When born it weighed 213½ lb. and stood 35 inches high. It has not been weighed recently, but is growing rapidly, as all elephants do for the first three or four years of their lives. In its intercourse with human beings it is disposed to be friendly and inquisitive, poking its little trunk into the pockets and up the sleeves of those whom the mother allows to approach it. The mother is, however, extremely jealous of strangers, and will not allow some old comrades and pets in the shape of a pair of coach dogs to come too near. The other elephants in the menagerie, being of her own kind, she regards as reliable friends, and seems only flattered by the caresses they bestow upon her little one.



THE ELEPHANT CALF AND ITS MOTHER.

Hybrid Fish.

At the meeting of the American Fish Cultural Association in this city, March 30, Mr. R. B. Roosevelt read a paper on hybrids, in which he said that, since the creation of the fish hatchery commission several attempts have been made to cross varieties of fish, and with success in the following varieties: Salmon trout with white fish; salmon trout with brook trout; brook trout with fresh water herring, with California salmon, and with the California mountain trout; shad with striped bass and with herring. Of these crosses there are the young, now in the hatching-house, of the salmon trout brook trout, brook trout California salmon, and brook trout California brook trout. It is observable of all hybrids that they are usually more shy and wild than either of their parents, and that in appearance they generally favor their larger parent. The cross between the brook trout and California salmon and the salmon trout and brook trout bid fair to be fine fish. Those now in the hatchery are eight inches long.

The cross of the shad and herring, though not made under the most favorable circumstances, has done well. The young have thriven, and have been caught in the rocky shallows of the Hudson. They probably are not migratory, and can be taken with rod and line. The cross between the shad and striped bass has not been heard from. As some of these were hatched in the autumn of 1876, and quite a large number in the succeeding year, it was hoped that some of them would have been taken, full grown, before this. The final outgrowth of this experiment is left entirely in the dark. There can be no doubt, however, of the cross being made.

It was hardly to be expected that so wonderful a discovery as the creation of a new species could be made without trouble, and we should rather be surprised at the success already achieved in hatching the young of the cross at all. The number of combinations possible is very large, and the pains and care expended in improving plants, vegetables, and land animals may yet succeed with fish.

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The Eye Parasite—*Dracunculus loa.*

Doctor H. M. Bachelor, of the American Presbyterian Mission at Gaboon, on the West Coast of Africa, communicates to the *Medical Record* the following interesting account of the eye parasite known as *Dracunculus loa* and *Filaria loa.*

A native young man presented himself, complaining of a "sick eye." I examined the organ, says the doctor, and discovered a white worm coiled up. Its situation was on the iris, beneath the sclera; but it was not at all confined, being capable of moving about, and even obstructing vision when in front of the pupil. It was constantly in motion. The eye itself was bloodshot and inflamed, while the lachrymal discharge was profuse. I succeeded in extricating it in the following manner: Holding the eyelids firmly open, the point of the small blade of an eye knife was inserted between the sclera and iris, care being taken that one end of the worm was between the blade and sclera. The handle of the knife was then depressed so that the point would, in being carefully withdrawn, cause the end of the parasite to protrude through the opening in the sclera. This accomplished, it was easily seized and removed with a pair of ordinary dressing forceps.

The *Filaria loa* is, I think, quite rare, or at least is seldom taken out entire. If I am rightly informed, only one specimen has reached the United States; but the French are conversant with it. It *generally* selects the lower eyelid for its first appearance, though it is often found in the pinguis. If undisturbed it causes intense itching and stinging pain in the part occupied by it, which symptoms disappear in two or three days, caused, no doubt, by its death. It is not considered dangerous or even serious. The specimen sent to America by one of the missionaries here was not entire, having been torn in the operation of extraction. The one in my possession is, I think, complete.

The writer adds that he has the specimen in a fifteen per cent solution of alcohol, and will be glad to forward it for examination to any oculist who is sufficiently interested to study it thoroughly.

The Ajax.

The turret ship Ajax was successfully launched from Pembroke Dockyard in March last, in the presence of a vast number of spectators. She was commenced four years ago, and is one of the heaviest war ships in the world, carrying four 38-ton guns in her turrets, and two 6-inch guns on her superstructure decks. The total weight of the armor plates, including the armor to the turrets and thick protective deck plating, is about 2,418 tons. The armor plates in the turrets are 16 inches thick in wake of ports, and 14 inches elsewhere. This armor will be compound steel-faced armor, which has recently been found by experimental tests, by being fired at- to possess a very much more effectual resistance to shot and shell than the armor plates which have been used up to the present time. The Ajax will also have an armor shield, composed of armor plates 12 inches thick, situated in the chart house or conning tower, which is built in an elevated position at the fore end of the citadel, in a line with the bridge, communicating between fore and aft superstructure decks. This shield is to afford protection to the captain of the ship, who will conduct the whole working of the ship from this look-out, by means of telegraphs and voice tubes. He will also be able to steer the ship himself, by means of steam, although the steam-steering engine itself is right away aft, below the armor deck. He will also give his commands to the captains of the turrets, and fire the guns by electric wires. In fact, nothing will be done in any part of the ship, when in action, except under the direct command of the captain in this tower. The Ajax was designed by the Council of Construction at the Admiralty.

Prison Labor.

About a year ago the New York State Assembly called upon the Superintendent of the State Prisons, Mr. Louis D. Pilsbury, to examine and report upon the contract system of prison labor. Mr. Pilsbury's report is in the main favorable to the system, his experience and study leading to the following conclusions, namely, that every prisoner who is able to do so should be required to labor, and that this labor, for moral as well as for economic reasons, should be productive; all systems of non-productive labor, merely for punishment, having been abandoned by civilized governments, because it is degrading and mischievous in its effects upon prisoners and unjust to the State. Such labor lies at the foundation of every successful system of reformation. Society has a right to demand it as a partial restitution for the depredations of criminals, and for the cost of their arrest, trial, and maintenance in prison.

That no system of prison labor which human ingenuity has yet been able to devise is free from objections; but that, so long as the people of this State demand that the prisons shall be self-sustaining, the present contract system is, in Mr. Pilsbury's opinion, to be preferred, because—

1. It produces the best financial results.

2. It does not interfere with outside mechanical industries any more than any other system of productive labor that has yet been devised.

3. It gives to the prisoners some knowledge of a handicraft and enforces habits of industry, without which they are almost sure to return to a criminal career, and with which they are enabled to, and in many instances do, lead honest and useful lives upon their discharge.

4. It is not injurious to health, as is shown by the small number of hospital patients in our State prisons, and by mortality lists that compare favorably with those of communities in general outside of the prisons. Our convicts generally leave prison in better mental and physical health than when received.

The cost of maintaining the prisons of this State for the last fiscal year was $20,374.15; in 1876 the cost was $605,040.53. It is not claimed that these results are due entirely to the contract system; but under any other system they would have been impossible. The charge that contract convict labor materially interferes with free labor has not been proved. Compared with the total productions of the country the products of the prisons are insignificant.

There are 23,524 convicts in all the prisons of the United States employed at productive skilled labor, who compete, according to the census of 1870, with 666,625 workmen (less than four per cent) employed at the same industries in the same States, and with 269,240 workmen (less than two per cent in the whole United States engaged in the same industries as are carried on at the prisons. The percentage would be still less if the increase in the number of mechanics and laborers since 1870 were known.

The complaint that prison labor contractors injure other manufacturers and laborers by underselling the market, Mr. Pilsbury thinks unfounded in fact. And the impression that the contract system interferes with the discipline of the prisons is also pronounced erroneous.

Some Facts about New Zealand.

Mr. G. W. Griffin, U. S. Consul to New Zealand, reports a notable increase in the manufacturing interests of the colony, and a growing trade with this country. He thinks the furniture made in New Zealand the most beautiful he has ever seen. It is made of the mottled kauri wood, and is artistically designed. New Zealand produces the finest wood in the world, and manufactures some of it. The chief imports from this country are hardware, edge tools, and agricultural implements; tobacco, canned fruits, and wooden ware, including wagons and carriages. The inhabitants have a partiality for American watches, but do not take to American whisky. The only article sent from New Zealand to this country is kauri gum, which is largely used in the manufacture of varnish. One firm, which ships direct to the United States, sends four or five times a year cargoes worth $100,000 each. The gum is very transparent; one can see through a block of it a foot in thickness. It has the appearance of amber, and is found about the roots of the kauri trees. The natives make very artistic figures of their gods with this gum, carving heads and busts of it larger than life.

Is there a Central Sun?

It is singular, remarks Mr. R. A. Proctor in the Newcastle *Weekly Chronicle,* how strongly some errors retain their hold on men's minds. When Mädler announced his belief that Alcyone, the chief star of the Pleiades, is the central star of the universe, men's minds were attracted by the thought that the steller system, like the solar system, revolves around a center. Yet astronomers knew perfectly well that the evidence on which Mädler based his theory was exceedingly feeble. Sir John Herschel also pointed out how unlikely it is that the center of the Milky Way, if such a center there really is, can lie so far away from the mean plane of the Milky Way as the Pleiades. I have shown since that the only piece of positive evidence advanced by Mädler, the drift of the stars of the constellation Taurus in one direction, is in reality no evidence at all, for the simple reason that a similar drift can be recognized in other regions of the steller heavens. I believe that no astronomer of repute would now venture to maintain the theory that Alcyone is the central sun of the stellar system, while scarce any (if any) would maintain that there probably is a central sun at all. Yet I find that not only is the belief still widely spread among the general public that Alcyone is the central sun, but that this theory excites far more interest than most of the real discoveries, interesting though they are, which have been made during the last half century. When I reached Indianapolis I found myself called on to decide, not whether the theory is true or not, but whether it is due to Bessel or Mädler. My statement that the origin of the theory was scarcely worth considering, since the theory itself was long since exploded, was received in solemn silence, as if my words were scarcely credited. And when I had endeavored, and I think succeeded, in showing good reasons for rejecting the theory, I could still feel that most of my audience would a good deal rather have seen the theory established than overthrown. Such is the dominion which error sometimes achieves oven men's minds.

The Great Southern Comet.

A private letter from Mr. Gill, H. M. Astronomer at the Cape, furnishes some particulars of his observations of the great comet up to the evening of February 9. Table Mountain interfering at first with the view from the Royal Observatory, Mr. Gill proceeded to Seapoint, on the west side of the mountain, where, from the garden of Mr. H. Solomon, in which Sir Thomas Maclear observed Donati's comet in 1858, he sketched the position of the tail among the stars on several evenings before the nucleus had withdrawn sufficiently from the sun's place to be visible. The nucleus was first seen on February 8, and then only for a few minutes through cloud; Mr. Gill thought it might have been visible the preceding evening, but haze near the sea horizon rendered it very difficult to say where the tail ended. He describes it as "a very poor affair, a faint nebulous thing not at all worthy of so fine a tail." Attempts were made to fix its position at the Royal Observatory on February 9, but only a glimpse with an opera-glass through cloud was obtained. The nucleus was "a little N. and E. of Theta Sculptoris;" in a tracing accompanying the letter in question, however, the nucleus is shown a little *south* and east of the star, and midway between two stars, which from Gould's "Uranometria Argentina," appear to be Lacaille 6 and 34, so that the place referred to the epoch of the "Uranometria," 1875·0 would be in about right ascension 2° 20′ with 37° 50′ south declination, which is far from the position given by the elements telegraphed from Rio de Janeiro (to which reference was made last week) whether the heliocentric motion be assumed direct or retrograde; probably the orbit has been vitiated in transmission. On February 6 the tail appears to have been traceable nearly to Canopus.—*Nature.*

A Pleasant Surprise.

"L. T. Edleblute, of Cincinnati, upon returning from Leadville, has found a bonanza awaiting him in the shape of an offer of $50,000 for the right to manufacture his patent metal vehicle hub. The hub is so constructed that the butts of the spokes rest on rubber, giving a large degree of elasticity, and at the same time preventing all rattling, rumbling, and tremblings. It can be readily taken apart for repairs."

In sending the above clipping from the Cincinnati *Commercial Advertiser* of March 14, Mr. Edleblute adds: "The above patent was secured through your agency, and thanks to your skillful management, for the claims are unusually strong. The final papers will issue inside of three weeks. I believe that my hub will surely prove quite a financial success. I am now entertaining an offer from a Pittsburg house that will exceed above amount. By your excellent services in my behalf you brought to me the exceedingly large offer, for had not my case been well conducted I would, no doubt, have had to wait some time for a customer."

The Artificial Diamond Process.

The announcement that Mr. Hannay's paper on the artificial formation of the diamond was to be read at the Royal Society, February 26, brought together a large number of Fellows and their friends. After the meeting a scrap of paper with the following lines penciled on it was picked up not far from where the treasurer of the Royal Society had been sitting:

"The crystallized carbon, as diamond known,
Manufactured can be, Mr. Hannay has shown.
From some hydrocarbon set hydrogen free
Near a nitrogen compound, that stable must be,
In the presence of metal—magnesium or sodium—
And the brilliant result is the jewelers' odium."

The Best Vehicle.

An anecdote is told of a physician who was called to a foreign family to prescribe for a case of incipient consumption. He gave them a prescription for pills, and wrote the direction: "One pill to be taken three times a day, in any convenient vehicle." The family looked in the dictionary to get at the meaning of the prescription. They got on well until they got to the word vehicle. They found "cart, wagon, carriage, buggy, wheelbarrow." After grave consideration they came to the conclusion that the doctor meant the patient should ride out, and while in the vehicle he should take the pill. He followed the advice to the letter, and in a few weeks the fresh air and exercise secured the advantage which otherwise might not have come

Remedy for Hydrophobia.

M. Torres Coïcedo, Minister from Salvador, has just made a gift, says *La Nature,* to the Zoological Garden of the Bois de Bologne, of two curious plants—the "guaco" and the "cedron"—which for a long time have been extolled in America as antidotes to snake bites and hydrophobia. The discovery of these plants was quite singular. Some Indians had observed that a bird of prey, which captures and feeds on snakes, sought out the vine of the guaco, ate its leaves, and plastered them over its plumage. They were thereupon led to utilize the therapeutic virtues of the plant, and by its use effected marvelous cures in cases of hydrophobia, snake bites, and marsh fevers. The discovery of the properties of both the guaco and cedron, however, had already been made by Dr. Saffray in a voyage made by him through New Granada in 1869.

AN English manufacturer traveling in America for the purpose of inspecting various industrial establishments has recently written as follows: "I spent some hours yesterday at the Cleveland rolling mills. They have a wire mill attached for drawing nothing but Bessemer steel wire, of which they turn out 75 tons per day, and have one room with 1,000 small blocks, each man tending 32 blocks, whereas in England we consider a man that runs 8 blocks of steel is a wonder. So much for your country. I saw it with my own eyes, and was never more astonished."

Eighty Miles an Hour.

The *National Car Builder* says that a locomotive on the Pennsylvania railroad made the fastest run on record a few evenings ago. It was ordered from the round-house to the scene of an accident, and ran 60 miles in 45 minutes and 8 seconds. This is at the rate of a trifle under 80 miles an hour, and is a very remarkable performance.

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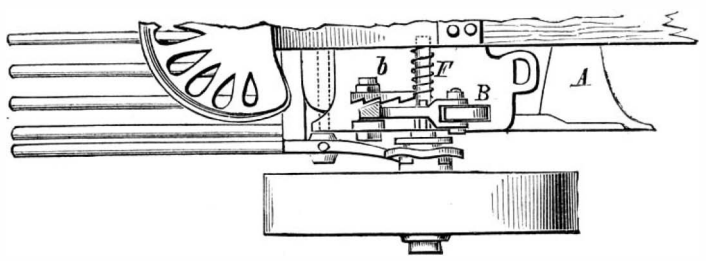
IMPROVEMENT IN POTATO DIGGERS.

The annexed engraving shows an improvement in potato diggers patented by Mr. James B. Taylor, of Leadville, Col., P. O. Box 2566 (formerly of West Hurley, N. Y.). The engraving shows only the portion of the machine that gives motion to the separating tines, C, and the shifting and adjusting mechanism. For a full perspective view the reader is referred to page 166 of the current volume of the SCIENTIFIC AMERICAN.

The plow, A, is suspended from a long bolt that extends across the rear of the machine frame, and is provided with a curved arm, which is jointed to a lever, B, pivoted to the main frame, and capable of engaging with a ratchet, *b*, so as to hold the plow at any desired elevation. A screen, C, consisting of a series of fingers projecting from a cross bar, is pivoted at one side of the machine, on the same bolt that sustains the plow, and is provided with an arm, D, carrying a roller that is engaged by a zigzag cam on the axle. This cam is movable on the axle, and is provided with lugs that may be thrown into or out of engagement with clutch teeth on the hub of the driving wheel by a shifting bar, F, which is always pressed by a spring tending to throw the cam out of engagement with the drive wheel. The shifting bar is provided with an inclined arm which is engaged by the lever, B, whenever it is thrown forward to depress the plow, thus throwing the cam into gear. It will thus be seen that by moving the lever, B, so as to throw the plow into position to operate, the shifting bar, F, throws the cam forward into engagement with the drive wheel. As the machine is drawn forward the plow, A, passes under the hills of potatoes, and both potatoes and earth are forced backward over the screen, C, which being vibrated by cam, E, separates the earth from the potatoes and delivers the latter in rows on the top of the ground.



TAYLOR'S IMPROVED POTATO DIGGER.

The Roller Suit.—The Patent Declared Invalid.

In the Circuit Court of the United States for the Eastern District of Missouri, September term, A.D. 1879: Robert L. Downton, plaintiff, *vs.* Yaeger Milling Company, defendant.—Patent.—W. G. Rainey and George Harding, Esqs., attorneys for plaintiff; G. M. Stewart and F. W. Cotzhausen, Esqs., attorneys for defendant.

Oral remarks of Treat, J., deciding cause:

I am prepared to announce my conclusion in the case of Downton *vs.* The Yaeger Milling Company. This case was presented at great length last spring, and it was announced to counsel at that time that if the court was compelled, as matters then stood, to decide the case, it would have to decide it in a certain way, but it would be more satisfactory if on certain points it could be more fully presented. That has been done, and very ably.

One of the points as to which the court was troubled, was whether, under the existing state of the art—this being a process patent—there was any novelty in it. Second, was the patent itself sufficiently specific in its terms to make it practicable, or, in other words, patentable, in the form pursued?

It is not proposed this morning to go through the milling literature with regard to these matters, as the various stages of all the matter involved were fully considered at the time of the hearing of the milling cases before Judges Dillon, Nelson, and myself. We were then very fully instructed as to this new process, and also as to the state of the art when the new process arose, and the conclusions announced in that case are very familiar to the counsel in this case, and to the milling public generally by this time.

Now, the mills using this new process interject rolls at various stages in connection with grinding, and after purifying, regrinding the purified middlings. Counsel were asked whether they construed this particular patent as covering *any* use of rolls on purified middlings at any stage of the successive grindings, or whether, under their construction of the patent, it was a use of rolls, one or more, at a stage intermediate the first and second grindings. Counsel were understood to say that the interjection of such rolls at any one of these successive stages was within the terms of the patent. The importance of that, if the testimony is understood, relates to the question of infringement.

There was a controversy at an early stage of this case growing out of the transactions between Downton, Allis & Co., of Milwaukee, and this defendant, Yaeger. Judge Dillon and myself disagreed in opinion with regard to the effect of the paper transactions involved; but his ruling with regard to the matter was necessarily the ruling in the case. He held that if there was an infringement of this patent then the defendant must answer except as to the two chilled iron rolls interposed between the first and second grindings, according to the terms of the patent; because Allis & Co., who were to some extent assignees in this matter, made those rolls according to Downton's description, Downton himself superintending the whole matter, and putting them in the mill. The contention being, on the part of Downton, that he informed these parties who had bought these rolls, which came under a subsequent patent, that while he put them in, they must give him a royalty under his process patent, and hence any use of the rolls by those parties did not exonerate them from a royalty therefor. Judge Dillon and I concurred as to those two; said they were supposed to have been put there for some purpose; they were put there by the plaintiff and under his very patent, and if it is said that they were put there merely to clog the machinery, and for nothing involving a purpose, such a proposition cannot be maintained.

Now, the court is brought, for the purposes of this case, to the construction of this patent. It has been read and reread very carefully. If there is anything in it that is patentable and involves novelty, it is not the use of rolls at every stage of this process, for all the Minnesota mills had been using it before, and in Europe and Missouri the same thing had been practiced for a long series of years. But it was the interjection of rolls between the first and second grindings, whereby certain effects would be produced—that is, such use flattens the germ or embryonic part of the berry, and also the pellicle, by a crushing instead of a grinding process. It is very obvious to any one who has looked into this subject, that if this grinding process is continued, whereby all the matter of the berry, including the germ—which seems to be the most obnoxious part of the whole—is mixed, then, instead of getting a first quality of flour, you have flour that is somewhat inferior in its character; for this waxy germ in itself has no especial nutritive property, but damages the flour through various causes. Hence, if you can take that out in the first instance, so that it shall not be ground into the body of the flour, it is certainly a most beneficial effect. To do it, you must crush, not grind, for this little embryonic particle is so very minute that unless you flatten it, it may, under trituration or grinding, pass into the middlings, and if you grind the middlings, it will go into the body of the flour. So that the true construction, and the only construction that will uphold this patent, is the interjection of those rolls between the first and second grinding of the purified middlings. By that means the fluffy matter would be thrown off, leaving the tailings to be operated upon thereafter. Then comes the next question, If that be the true reading of the patent, did this defendant use anything but the two chilled iron rolls at that stage of the process? The evidence is very uncertain on that point.

Some say that under the Wegmann patent, porcelain rolls were used at various stages. But no matter as to that. This question is one to which the court asked particular attention, namely, here is a statement that by the use of rolls in a particular stage of this process, certain beneficial results can be had; that is, a flattening of the germ so that it will not pass through the bolts.

Now is that to be construed in this way: that any device that might at any time thereafter be had, whereby such a result may occur, is covered by this patent? It seems that anterior to this patent, Mowbray and others had been using rolls, and in that very stage of the process, but the contention was that the particular rolls that they were using did not effect the end to the desired extent; and hence subsequent to this process patent, it became necessary to have some rolls invented which would effect the end.

Now it is an elemental proposition as to patents that they shall be so clear that by ordinary means they can be worked out by a person skilled in the art. It is clear that this patent could not be operated by any method until some person invented rolls, which, while they should not be corrugated, because that would be as bad as the millstones in triturating, but should be smooth and yet have sufficient grip and be of sufficient hardness; and that was not all, they must have the same diameters and work with equal speed, instead of differential speed. Neither of which was suggested in the patent.

To summarize: The claim of the patent is specific. "The herein described process of manufacturing middlings flour by passing the middlings after their discharge from a purifier, through or between rolls, and subsequently bolting and grinding the same, for the purposes set forth." Those purposes, as the specification states, are mainly for flattening the germ. That object was effected by the interposition of rolls at that particular stage of the process. Rolls at other stages of the milling process had been previously used; and even rolls by Mowbray at that particular stage; hence if the patent is to be construed by its terms as covering the use of rolls at any stage of the milling process, it had been long anticipated prior thereto. If it is to be restricted to the use of rolls at the particular stage mentioned, then, so far as this case is concerned, the plaintiff is estopped, because he himself, as heretofore decided, placed the only rolls used at that stage in the defendant's mill.

On the other hand, irrespective of the question of estoppel, if the patent is for a process to be effected without any known means of accomplishing the result; but requiring inventive faculty whereby rolls to accomplish the purposes and their modes of operation were to be determined by new inventions or discoveries, then the patent does not furnish to any one, as then skilled in the art, means whereby the beneficial end could be accomplished. No one in the then existing state of the art could by the use of any rolls known or by any mode of operating the same, have effected the designed end. Consequently to uphold this patent for a process which would have been ineffective without some inventions thereafter had, would be to block the path to all future progress in the art of milling.

The necessary result is that I dismiss the bill—the patent being void for want of novelty, and uncertainty.

Experience with a Home-made Electric Machine.

To the Editor of the Scientific American:

Reviewing my back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT a short time ago, I became interested in an article headed "How to Make a Dynamo-Electric Machine,"* and having a desire to study the construction of such machines and the principles therein involved, became intensely interested in the article. I digested as thoroughly as possible the practical descriptions and directions there given with a view of constructing one myself. After mastering the details, I set to work and constructed first one and then a second one, both of the same size, and the first one implicitly according to the directions there given, the second one with slight modifications. I think I have been successful in making two fairly good machines.

Probably others of your readers, interested in a like manner as myself, have been engaged in the same thing, and possibly you may know the result of their efforts.

Of course it must be some gratification to you to know that your labors, and the valuable directions and information on practical subjects which you diffuse among your readers, are fruitful of good results. Presuming on this, and claiming your indulgence on that account, and also to afford a comparison with results others have obtained, I will give you a short description of my machines and what they will do.

The two machines, which I call No. 1 and No. 2, stand side by side on a baseboard 10½ by 15 inches, and 1 inch thick. Their general construction is the same as given by you in SUPPLEMENT No. 161, except that a little longer length of wire is wound around each arm of the magnets than there given, and also around the armature, each arm of the magnets containing about 250 feet of No. 16, and each armature about 45 feet of No. 18, covered wire. One drive wheel can run one or both machines at the same time, and to enable me to increase its size, I placed a block of wood 3 inches high on the top of each magnet, with a transverse piece laid across, also 3 inches thick, the whole bolted firmly to the top of both magnets; on the top of this transverse piece stand the bearings for the drive wheel, which is 17½ inches in diameter; it would be better if it was still larger.

Either one machine will heat 3½ to 4 inches of 36 platinum wire to a white heat, and a shorter length to incandescence, and finally melting it. It will rapidly decompose water, producing 1½ cubic inches of gas in two minutes. It produces large bright sparks and strong shocks on breaking contact, and will produce a bright electric light with apparatus described in SUPPLEMENT, No. 149. With both machines combined the effects are very much increased.

By using No. 1 machine to charge the magnet of No. 2, and taking the current from the armature posts of No. 2, I can heat 10 to 12 inches of 36 platinum wire to a white heat, and forming the wire into such a shape as to reduce the radiation, I can heat 14 inches to incandescence, can decompose 1 cubic inch of gas in one minute, heat a thin carbon pencil 1½ inches in length to a white heat the whole length; and as the carbon consumes the brightness increases, until it reaches brilliant incandescence, when it finally disintegrates. Connected in this manner it will also work an induction coil.

With platinum wire I can produce a light equal to six candles, and could do better but for fear of melting the wire. With the electric light apparatus I can produce a light equal to a four foot gas burner.

I am pleased with the machines; they answer nearly all the purposes of a battery, and are always ready, a few turns of the wheel producing a current instantaneously, and continuing steadily so long as you turn the wheel.

I would like to know whether my machines will compare favorably with others.

J. PICKARD.

Morrisania, N. Y., March 25, 1880.

[Our correspondent could not have done better with a machine of the size and character described. Few have done as well, although many have made the trial. Some of our correspondents write after this fashion: "I have constructed a dynamo electric machine, carefully following the directions given in your SUPPLEMENT, No. 161, with a single exception"—naming the exception—"and it fails to work!!" Mr. Pickard has made two machines, following our instructions, and they work exceedingly well; others have done the same thing. The fact is the "*single exception*" must be charged with the failure experienced by our unfortunate correspondents.]

THE HUMAN RETINA.—In a recent note to the Vienna Academy Herr Salzer offers an estimate (based on numeration) of the probable number of optic nerve fibers and of retinal cones in a human eye. The number of the former he supposes to be about 438,000, that of the latter 3,360,000. This gives seven or eight cones for each nerve fiber, supposing all fibers of the optic nerve to be connected with cones, and equally distributed among them.

* In SUPPLEMENT, No. 161.

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Faber's Talking Machine.

The celebrated Faber talking machine has had its powers of articulation almost doubled by the nephew of the original inventor, also named Joseph Faber. Describing a recent exhibition of the machine, the London *Times* points out that its chief points of interest to the physicist, the physiologist, and, it may be added, the philologist, lie in the results obtained from the ingenious contrivances by which the functions of the flexible and mobile organs of voice are performed. The principal features of the machine are, to begin with, the bellows, from which the air is driven with considerable but varying force, by means of a pedal lever. The air passes in a horizontal stream through a small chamber, which represents the human larynx, and in the same right line out through the mouth. The lips and tongue are of India-rubber, and the lower jaw is movable. Below the laryngeal apparatus, and opening from the chamber in which it is contained, is another smaller chamber, about the size and shape of a lemon, from which a pipe curved upward allows the air when driven through to escape. This supplies the place of the nose to the instrument, and when a valve is opened, enables the sound of the letter *m* and *n* to be produced by the striking of the same keys with which the sounds of *b* or *p* are obtained. The larynx is, of course, the most complex part of the machine, and to Herr Faber is due the elaboration of this portion of the mechanism. Within a small oblong box, a narrow and exceedingly thin strip of hippopotamus bone, strengthened by India-rubber on one side, produces, by its vibrations, the speaking tone, which may be called the fundamental sound to be subsequently modified. At the will of the operator the pitch can be raised or lowered, but not during the utterance of a word or sentence, so that in saying "Mariana," or "*Comment vous portez vous!*" (the machine talks French, German, Italian, or English) the keynote remains unaltered to the end. In front of the vocal cord and within the laryngeal chamber are stops or diaphragms, placed vertically, and rising and falling like the wards of a Chubb's lock, but different in that each stop is a complex machine in itself, having within, moved by a spring, another stop, by means of which an orifice at the base is enlarged or diminished. Herr Faber has taken another liberty with nature, for, besides placing the nose below the mouth, for the sake of convenience, he has placed the teeth in the larynx, or, more strictly speaking, with one of these stops he gets a somewhat lisping "*s*" or the sound "*sh*" from the machine. A small windmill-like arrangement gives the rattle of the letter "*r*," and a thin iron band, notched in the lower rim in front, fitting outside the upper lip, descends to give the "*f*" or "*v*" sound. There are fourteen keys by which sounds are controlled. Striking the first the sound of "*a*" in "father" is produced, the mouth remaining wide open; another key being struck, the lower jaw rises and the sound of "*o*" in "bowl" is given; a third key moves a lever, which nearly closes the mouth, and the sound of "*o*" in "movement" is emitted. The other vowel sounds and the consonants are produced by the use of the diaphragms in the larynx with the mouth in the second or third position.

The French Vintage of 1879.

The gross production of wine in France last year was only 25,700,000 hectoliters (565,400,000 gallons), or 25,000,000 hectoliters (550,000,000 gallons) less than in the previous year. This enormous falling off—nearly one-half—is not entirely attributable to the ravages of the *phylloxera* and *oïdium*. These pests have certainly spread widely and rapidly, but, in addition to them, the wine growers had to contend with very unfavorable climatic conditions. The cold and wet which prevailed throughout the year prevented the grapes from fully ripening, and some districts were visited besides with very sharp frosts as early as September. The districts which suffered most severely were the Burgundy and Champagne districts, where the crop is almost entirely destroyed. The south of France suffered less than the east and center. The Departments of L'Aude, Hérault, and Pyrénés Orientales, gave an increase in the production amounting to about 2,000,000 hectoliters, or 44,000,000 gallons. The area of land under vine cultivation was reduced during the year by 51,512 hectares, or 129,000 acres, making the total reduction in the acreage of French vineyards since 1874 no less than 150,000 hectares (370,000 acres). Compared with previous years, it is some satisfaction to find that the rapid diminution in the production of wine in France is not without a parallel. From 1853 to 1856 the produce fell gradually from 22, 21, and 15, to 10 millions of hectoliters in the four years. By 1863 the quantity of wine produced had increased to 50,000,000 hectoliters, and finally, in 1875, it reached the unparalleled figure of 83,000,000 hectoliters. The production of cider last year also fell off, being 4,197,000 hectoliters (92,334,000 gallons) less than in 1878, and more than 3,000,000 hectoliters less than the average of previous years.

Remarkable Shooting.

Another extraordinary marksman, who is said to excel Dr. Carver, is Dr. John Ruth, of California, an account of whose exploits is thus given in a recent issue of a San Francisco paper: "Dr. Ruth then proceeded to give an exhibition of fancy shooting at a glass ball held in the hand of his attendant, he taking aim through his legs, with his back to the object. He also held the rifle with the butt resting upon the top of his head, the hammer pointing downward. He also shot with his back reclining upon a table. In all these experiments he was successful on the first attempt. Turning his back to the attendant, he sighted the rifle by the aid of a small hand mirror, and broke the ball at the first trial. Perhaps the most wonderful feat that he accomplished, and one requiring considerable nerve on the part of both himself and attendant, was shooting a cigar out of the mouth of the latter. Another interesting experiment was shooting without a sight, that essential adjunct being covered by a piece of card board placed around the barrel at its extremity. The absence of the sight apparently made no difference, as the destruction of the vitreous spheres continued unabated. The following experiments were also successfully accomplished: Shooting a ball from the head of an attendant, the latter being blindfolded; the same feat with the bandages removed from the attendant's eyes and the latter looking into the muzzle of the rifle; one hand shooting with a small rifle, manipulated in a variety of difficult ways, holding the rifle with the hands placed back of the neck. In none of these shots did the doctor fail to shatter the balls from the hand of the attendant. One of the most marvelous feats performed was the following: Placing a glass ball upon the ground, the doctor shot in front of it, and plowing under it, sent it flying several feet in the air by the force of the concussion, and before it reached the ground shivering it with a second bullet. Dr. Ruth's wife is nearly as expert as himself in the use of the rifle."

Photographs as Legal Evidence.

The London *Photographic News* thinks that photography is destined to play a very important part in legal proceedings, especially in cases of accident, when the causes are disputed, and when it is essential an exact representation of the condition of affairs immediately after the accident should be laid before a jury. Such photographs, however, require to be executed with some degree of intelligence on the part of the photographer, and an appreciation of the facts of the case, or they may become absolutely misleading. Precise as the camera is, it would not be very difficult, we fancy, by the use of an unsuitable lens, and by the choice of an improper point of sight, to give an idea of the appearance of any place quite foreign from the truth, so far as relative proportion is concerned.

The *News* recites a case where a photographer made a blunder of this kind, which proved very disastrous to his client. The latter was very anxious to obtain a spirit license for a large public house he had built. The chief opposition to his application came from a neighboring Boniface who had had undisputed possession of the custom of the locality for some years, and who, of course, did not want an intruder. The applicant's house was situated on the top of a gentle slope at the corner of two roads, and was really an imposing looking edifice; the opponent's house was a somewhat stunted building, also at the corner of two roads, but with a considerable frontage on one side. It occurred to the applicant that if he could only lay the photographs of the two houses before the visiting justices they would be so overcome with the contrast presented that they would immediately grant him a license. Accordingly he had the two photographed. Unfortunately the photographer used a short-focus, wide-angle lens, and, selecting his point of sight in respect to the new house opposite the angle (which happened, unfortunately, to be naturally rather an acute one) formed by the two sides of the building, produced a picture in which the two lines of the roof formed almost an isosceles triangle, while the house was squeezed together in the most absurd fashion. The perspective, in fact, was strained and unnatural, and the camera had absolutely made a picture which no human eye (unless it possessed a short-focus, wide-angle lens) could by any possibility see. To make the matter worse, instead of meting out the same justice to the old house, the photographer selected a point midway opposite the longest line of frontage, and planted the camera much nearer the object than he did in the first instance. The result was, that the old house in the photograph appeared much the more imposing of the two, and any one who had not seen the originals would have preferred it to the ungainly and disproportioned edifice of which the owner was so proud. At any rate, the justices thought so, and refused the license.

Waste of Fuel.

The wanton destruction of any kind of property is regarded as a crime, and the neglectful waste of the gifts of nature, bestowed for the common good of mankind, no matter how great their present abundance, ought equally to be held as an offense against the rights of humanity, and justly censurable.

Americans are proverbially wasteful, not alone in small matters but in great ones. This is exemplified in a striking manner in the anthracite coal regions of Pennsylvania, where, it is estimated, not less than one hundred million dollars' worth of fuel has been wasted in getting out and preparing the coal for market, the present average annual loss being set down at fifteen million dollars. This enormous waste is ascribed by men of experience to the use of imperfectly designed machinery for breaking the coal. This matter demands serious attention; for vast as are our natural resources, such extravagance will not only tend to exhaust them sooner than they should be, but also to increase present cost to consumers. Land owners and miners are, in this matter, equally remiss in duty to their successors and the people of the country, who have a right to demand that an article of such prime necessity shall be economically worked, in order to yield the best results to the various industries and comforts dependent upon this kind of fuel.

The great cause of this waste in anthracite coal is said by competent engineers to be what are known as coal crushers —toothed cylinders geared to run toward each other, which of necessity literally crush a great part of the coal into fragments and dust too fine for use, unless it can by artificial means be again made into blocks of suitable size. The percentage of waste is estimated at one-fourth the entire product, the greater part of which could be saved to the operators by the use of proper machinery. But the operators, it would appear, are a very conservative set of gentlemen, and opposed to innovations calculated to do away with time-honored methods. It is within the personal knowledge of the writer that a mechanical engineer of wide experience and thoroughly posted in the mining and marketing of anthracite coal invented and set up at one of the great coal centers machinery for the more economical preparation of the fuel. He invited the operators and engineers to come and witness his experiments, but few of them availed themselves of the opportunity; and although, as he claims, he can demonstrate beyond peradventure that he can save from fifty to eighty per cent of the coal now lost, he has as yet been unable to secure the adoption of his improved methods and machinery. This gentleman is a conspicuous example of a prophet being without honor in his own country.—*Coal Trade Journal.*

A New Measuring Implement.

A remarkable machine was described at a recent meeting of the Société d'Encouragement pour l'Industrie Nationale, at Paris, called profilograph, because when in use it traces mechanically on paper the outlines of the ground over which it travels. It is described in one of our foreign contemporaries as a small carriage mounted on two wheels, drawn by one man, and attended by another, who marks the levels at the proper places; and underneath hangs an iron rod with a large ball at its lower end, serving as a pendulum. This pendulum maintains a constant vertical position, while the machine inclines in one direction or the other according as it ascends or descends a slope. To the upper end of the rod is fitted a pencil, which marks on a sheet of paper the ups and downs of the country traversed, whether on an ordinary road or across trackless fields. The exact profile is thus recorded to a given scale. At the same time one of the wheels, acting the part of chain bearer, measures and indicates the distances traveled throughout the survey. For surveyors and others engaged in leveling operations, this machine would appear to be eminently serviceable, and there is talk of its being made use of in a new general survey of France contemplated by the government.

Milk and Lime Water.

Milk and lime water are now frequently prescribed by physicians in cases of dyspepsia and weakness of the stomach, and in some cases are said to prove very beneficial. Many persons who think good bread and milk a great luxury, frequently hesitate to eat it for the reason that the milk will not digest readily: sourness of stomach will often follow. But experience proves, says the *Journal of Materia Medica*, that lime water and milk are not only food and medicine at an early period of life, but also at a later, when, as in the case of infants, the functions of digestion and assimilation are feeble and easily perverted. A stomach taxed by gluttony, irritated by improper food, inflamed by alcohol, enfeebled by disease, or otherwise unfitted for its duties—as is shown by the various symptoms attendant upon indigestion, dyspepsia, diarrhea, dysentery, and fever—will resume its work, and do it energetically, on an exclusive diet of bread and milk and lime water. A goblet of cow's milk may have four tablespoonfuls of lime water added to it with good effect. The way to make lime water is simply to procure a few lumps of unslaked lime, put the lime in a stone jar, and add water until the lime is slaked and of about the consistence of thin cream; the lime settles, leaving the pure and clean lime water on the top.

To Cure Foot Rot in Sheep.

The preparation of the foot is just as essential as the remedy, for if every part of the disease is not laid bare the remedy will not effect a cure. A solution of blue vitriol as strong as can be made and as hot as you can bear your hand in, even for a moment, having the liquid three or four inches deep, or deep enough to cover all the affected parts; then hold the diseased foot in this liquid ten minutes, or long enough to penetrate to all the diseased parts; put the sheep on a dry barn floor for twenty hours to give it a chance to take effect. In every case where I have tried it, it has effected a cure, and I have never given a sheep medicine internally for foot rot. This remedy I call a dead shot when the foot is thoroughly prepared, but a more expeditious way, and where you don't hardly hope to exterminate the disease, but keep it in subjection, is this: After preparing the feet as for the vitriol cure, take butter of antimony, pour oil of vitriol into it slowly until the heating and boiling process ceases, and apply with a swab. This remedy works quicker, is stronger than the vitriol, and is just as safe, but its mode of application renders it less sure.—*Ohio Farmer.*

IN a small part of our issue of April 10, the firm name of the well known manufacturers of printing ink was misprinted. It should have been George Mather's Sons, 60 John street, New York city.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

11 Ton Compound Slotter for sale cheap. Slots 18 in.; radius 24 in. Address Fulton Iron and Engine Works, Detroit, Mich.

Patents for sale.—Excellent Garden Hand Pump, Well Pumps, Combined Sprinkler and Nozzle. See them work at No. 99 Gold St., Brooklyn, N. Y. N. Malmquist.

H. L. Perrine, Mech. Draughtsman, 617 7th St., Washington, D.C, Drawings for inventors from sketches or models.

Wanted—A Machine for Straightening Wire. Address, with price, E. M. Chafee, Onondaga Valley, N. Y.

We understand that Baldwin the Clothier, of New York and Brooklyn, employs more salesmen in his Boys' Department than any other retail clothing store requires for both men and boys.

At the American Institute Fair, New York, 1879, the "MacKinnon Pen" was awarded the grand medal of superiority. The judges' report reads: An important feature of this pen is that its point is a circle of iridium. The drilling of iridium to obtain a conical writing point has not, heretofore, been accomplished by any other maker, and is in itself a valuable discovery.

For Power Paper, Lard, Cider Presses, see adv. p. 252.

The Asbestos Roofing is the only reliable substitute for tin; it costs only about one-half as much, is fully as durable, is fireproof, and can be easily applied by any one. H. W. Johns Manufacturing Co., 87 Maiden Lane, N. Y., are the sole manufacturers.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., sole manufacturers, Fitchburg, Mass.

Catalogue of Useful Books on Applied Science sent free. E. & F. N. Spon, 446 Broome St., New York.

Blake Lion and Eagle Imp'd Crusher. See adv. p. 236.

For manufacturing sites, coke and gas coal lands, their qualities and prices, address Mellon Brothers, Pittsburg, Pa.

Foundry and Machine Shops for sale. Established in 1846. Write for description to E. J. Hoen, Addison, Steuben Co., N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 220.

Boiler Feed Pump, with tight and loose pulleys; sure to work. Price $32. York & Smith, Cleveland, O.

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Son & Co., Pittsburg, Pa.

Penfield (Pulley) Block Works. See illus. adv. p. 252.

Spokes and Rims, white oak and hickory, best quality, to any pattern, and Hammer Handles of best hickory. John Fitz, Martinsburg, West Va.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Twenty-five per cent saved by the use of H. W. Johns' Asbestos Liquid Paints.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 238.

Forsaith & Co., Manchester, N. H., & 213 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T. Shaw, 915 Ridge Ave. Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Portable Forges, $12. Roberts, 107 Liberty St., N. Y.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Eclipse Portable Engine. See illustrated adv., p. 222.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Peck's Patent Drop Press. See adv., page 236.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 238.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Company, Buffalo, N. Y

For Standard Turbine, see last or next number.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Wanted—The address of 40,000 Sawyers and Lumbermen for a copy of Emerson's Hand Book of Saws. New edition 1880. Over 100 illustrations and pages of valuable information. Emerson, Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 9 cents per pound. Fully warranted.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 252.

For Wood-Working Machinery, see illus. adv. p. 252.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 252.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

For Separators, Farm & Vertical Engines, see adv. p. 251.

The Horton Lathe Chucks; prices reduced 25 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

$400 Vertical Engine, 30 H. P. See page 254.

For Patent Shapers and Planers, see ills. adv. p. 251.

Emery Wheels of all kinds, and Machines at reduced prices. Lehigh Valley Emery Wheel Co., Weissport, Pa.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 17

The 1880 Pennsylvania Lawn Mower.—Light draught and easily adjusted. Machines warranted. See illus. adv. last week. Lloyd, Supplee & Walton, Philadelphia, Pa.

For Sale.—Two Windmill Patents, and set of patterns for same. None better. F. C. Maxwell, Columbus, O

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 254.

Patent Steam Cranes. See illus. adv., page 252.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 253.

Self-feeding Upright Hand Drilling Machines of superior construction. Pratt & Whitney Co., Hartford, Ct.

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Elevators.—Stokes & Parrish, Phila., Pa. See p. 254.

Mackenzie Cupola and Blower. The very best apparatus for melting iron; and with water bosh for smelting lead, silver, or copper ores. Send for pamphlet. Smith & Sayre Manuf. Co., 21 Courtlandt St., New York.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

For Middlings, Mill and Mill Furnishing, see adv. p. 222.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) S. H. H. asks how two minerals in powdered form, one specific gravity of 2·5 and the other of 3·5, can be separated. A. Both substances being insoluble in water, a part at least of the former might be obtained by aqueous suspension and defection, as in the purification of kaolin, especially if the lighter is also the softer and finer. The difference is almost too slight for even this, however. Perhaps some marked difference in solubility, fusibility, or polarity (magnetic) exists and may be availed of.

(2) C. C. H. asks for a cheap method of determining the presence of zinc in old pewter and britannia ware. A. Digest a fragment of the metal in a test tube with hot dilute muriatic acid, decant the liquid, and add to it sulphureted hydrogen water in excess; filter off the precipitate, and to the filtered liquid add ammonia water. A white precipitate indicates zinc.

(3) G. A. W. asks: 1. Is the presence of air in steam boilers injurious? A. No. 2. How is air expelled from boilers? A. Generally, when getting up steam, by leaving the safety valve open until the steam blows freely from it. 3. What will restore nickel silver that has been heated to a bluish color? A. Dip momentarily in strong nitric acid, rinse immediately in running water. Polish with crocus or rouge.

(4) W. and B. write: As to the per cent of power produced by overshot water wheels, we know of no tests having been made in this country, and presume there are but few persons competent to make such a test, we have overshot wheels 20½ feet high, which are about worn out, and have been urged to use turbines instead, but would like to learn what per cent overshot wheels of our height will give before changing. The turbine claim over 80 per cent. A. As a general result, a good overshot wheel driving machinery not requiring high speeds gives a better percentage than the turbine; for machinery requiring high speeds, a good turbine is to be preferred. A well proportioned overshot wheel should give 65 to 80 per cent; the average turbine will give 60 to 70 per cent.

(5) J. A. M. asks as to the proper size of cylinders for double engine (diameter and stroke); ample size for boiler for same, size of propeller and pitch of same, for fast steam yacht, 55 feet over all, 11 feet beam, 4 feet 3 inches draught at stern, to steam 15 knots at best speed in smooth water. A. For yacht 55 feet long and 11 feet beam, 2 engines, 9 inches cylinder by 8 or 9 inches stroke; propeller 3 feet 10, to 4 feet 2 inches diameter, and 6 feet to 6 feet 3 inches pitch; return tubular boiler about 5 feet 4 inches diameter and 8 feet 6 inches long, with 2 inch tubes.

(6) E. W. T. asks (1) how to stop leaks in boilers, especially at ends of (expanded) tubes. A. If the tubes are not too much wasted away, they can be made tight with a calking or expanding tool. 2. How to prevent foaming in boilers. A. Foaming proceeds from various causes, and until we know the cause, we cannot prescribe a remedy. The design may be faulty, or the circulation bad; too little steam room, or bad water.

(7) J. F. asks: Is there anything that will remove scales from steam boilers without injury to the boiler? A. There are many compounds used for the removal of boiler scale; they are nearly all effective with some kinds of water and useless with others. See our advertising columns for address of makers of boiler compounds. Tannate of soda, sal soda, petroleum, crude or refined, pieces of oak or hemlock bark or oak timber, soda ash, and gum gambier are often used. If the water is muddy, or contain much organic matter, it should be filtered before use.

(8) J. J. H. asks: 1. What is the best means of preventing scale in boilers where hard water is used and boiler inaccessible? A. See reply to J. F. on this page. 2. Ordinarily what horse power is produced on an engine of 8 inches diameter, 12 inches stroke, with 80 lb. steam pressure? A. At 100 revolutions per minute, 16 horse power, and for any other speed in proportion to the speed.

(9) J. J. W. writes: I am compelled to use in my boilers the water from a stream that is muddied by the washing of iron ore. It causes them to foam. Can you suggest any remedy, or manner by which I could use it without said result? A. See reply to J. F. on this page.

(10) H. L. C. asks: About what is the relative temperature of the water and the steam in a steam boiler when under pressure of 40 to 100 lb. per square inch? A. After a boiler has been in operation long enough for a thorough circulation, the temperature of the water is same as the steam, and the latter determined by its pressure, if there be no superheating.

(11) J. H. J. asks (1) for the proper mode of adjusting the slides of an engine in working position. A. A line is drawn through the center of the cylinder, and the slides set parallel to it in both directions. 2. To keep the rod the proper length in packing brasses. A. Have the draught of the key at one end of the rod in one direction, and of the other end in the opposite direction. 3. To obtain the half stroke of piston. A. The half stroke of the piston is the length of the crank.

(12) J. D. asks: 1. Can water be heated to a higher temperature than 212° Fah.? A. Yes. 2. How much greater percentage can I get from a copper heating surface than iron surface in a boiler, built locomotive style? A. Practically there is little or no difference between copper and iron.

(13) E. R. M. asks: Would a young mechanic make a locomotive runner with practice on the road with a good engineer that has had four years' experience with different kinds of steam engines, and have studied both Forney's and Roper's Catechisms of the Locomotive? A. Yes, with self-reliance, close observation, and industry.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

N. G. Co.—It is a variety of serpentine resembling coralite, a hydrosilicate of magnesia, (see p. 465, Dana's Mineralogy.)—A. G. S.—It is fool's gold, iron pyrites, sulphide of iron.

[OFFICIAL.]

INDEX OF INVENTIONS,

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

March 23, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Agricultural boiler, D. Felgar 225,814
Agricultural implement, W. A. Chapman 225,688
Animal trap, G. W. Lindsey 225,708
Animal trap, J. Quigley 225,763
Annunciators, push key attachment for, J. F. Martin 225,843
Bag tie, J. Hill 225,830
Baling press, portable, B. M. Watts 225,773
Barrel dumper, Briggs & Jones 225,792
Basin, wash, H. A. Skelley 225,880
Bed and bolster, woven wire, Wagner & Friedrich 225,737
Bed, wardrobe, N. G. Rood 225,765
Beer, etc., treating, Musgiller & Schedler (r) 9,129
Bell, call, J. P. Connell 225,690
Binder, temporary, White & Van Zuilen 225,901
Bisulphide of carbon engine, W. S. Colwell 225,689
Bit brace, N. Spofford 225,768
Boiler and heater, combined, D. Hawkins 225,823
Bonds, notes, and other evidences of value, S. R. Dummer 225,748
Boot and shoe calk plate, J. B. Weir 225,897
Boot and shoe lasting device, A. Davidson 225,806
Boot and shoe soles, extensible pattern for cutting, Simon & Lex 225,878
Boot treeing machine, J. E. Crisp (r) 9,124
Bridge, lifting, E. B. Whitmore 225,775
Bridle bit, T. T. Furlong 225,751
Brush, galvanic, B. H. Robb 225,723
Bugs from potato vines, machine for removing, G. E. Risley 225,870
Bung, vent, O. Zwietusch 225,906
Button for cuffs, etc., H. E. Moore 225,853
Button, separable, G. K. Webster 225,896
Cabinet, exhibiting, J. F. Martin 225,846
Canister, C. A. Fredericks 225,818
Car brake, automatic, H. Skinner 225,881
Car coupling, R. F. Krohn 225,840
Cars, sand distributer for street, S. S. Wood 225,904
Carpet lining, G. S. Page 225,718
Carriage bows, spring support for, Wilgus & Johnson 225,738
Cart, coal, V. D. P. J. Slattery 225,726
Caster, pickle, W. C. Beattie 225,786
Chains, manufacture of jewelry, R. F. Simmons 225,879
Change and delivering tickets in street cars, stores, etc., making, H. R. Robbins 225,872
Charm and similar articles of jewelry, F. E. Gilbert 225,821
Chuck, drill, R. E. Wilcox 225,902
Churn, J. D. Hobbs 225,832
Churn power, J. S. Smith 225,727
Churn power, V. H. Winchell 225,777
Cigar box for preventing revenue frauds, P. McAleer 225,848
Clock, calendar, W. H. Stewart 225,888
Coffee roaster stirrer, R. J. Morton 225,758
Collar, standing, Goldsmith & Merrill 225,699
Coloring matter, artificial, F. Z. Roussin 225,908
Colter, rolling, L. Chapman 225,743
Cooker, steam, W. B. Wood 225,905
Cornice, window, J. R. Shackleton 225,877
Corset clasp, W. McCabe 225,849
Cotton chopper, J. T. Sustaire 225,890
Cotton chopper and cultivator, J. B. Nichols 225,856
Counter stiffeners, machinery for shaping, G. L. Roth 225,875
Crayon sharpener, J. Suter 225,732
Cultivator, T. C. Darby 225,692
Curtain bracket, H. T. Warner 225,894
Curtain fixture, F. B. Scott 225,725
Curtain roller, W. B. Noyes 225,857
Cuspadore, J. M. Wheeler 225,774
Cut-off, steam engine, W. Redmond 225,866
Cutting blade handle, extension, W. Webster 225,895
Dental disk, felt, W. W. Smith 225,884
Disinfecting device for urinals, etc., E. J. Mallett, Jr 225,842
Dog iron mould, J. McDermott 225,712
Door, J. F. Martin 225,847
Door, screen, J. Barkheimer 225,680
Draught equalizer, F. Marsh 225,709
Draught regulator for harrows, P. H. Nelson 225,759
Dress stiffener, N. Jenkins 225,754
Drill and bit stock, combined, S. A. Bostwick 225,682
Eave trough hanger, A. H. Braunlich 225,684
Egg beater, J. Emmert 225,693
Electric motor, L. M. Sabin 225,724
Electrical conductor, E. U. Parod 225,861
Elevator and scales, combined, G. Van Winkle 225,893
End gate, W. Culbertson 225,803
Engraving machine, J. Hope 225,705
Envelope, H. & L. Planche 225,864
Evaporating apparatus, steam, D. K. Allington 225,781
Excavator, S. W. Rohn 225,873
Exercising machine, E. A. Tuttle 225,736
Expanding drill, L. F. Pond 225,720
Farm gate, I. Bush 225,686
Fence, barbed, T. G. Orwig 225,717
Filter, W. A. Pitt 225,863
Firearm, magazine, W. H. Elliot 225,750
Fluting machine, H. Albrecht (r) 9,127
Forging wrench heads, die for, L. Chapman 225,745
Fruit jar, Griswold & Moran 225,752
Fuel, combustion of, E. J. Brooks 225,793
Gas engine, Wittig & Hees 225,778
Gas, manufacture of nitrogen, T. B. Stillman 225,730
Gas producer, A. Faber du Faur 225,813
Gate, B. F. Luce 225,841
Glass stones to metallic frames, securing moulded, J. Fischer 225,816
Glass, wood, rubber, etc., ornamenting smooth surfaces of, R. Cunningham 225,802
Grain and seed separator, D. Geiser 225,696
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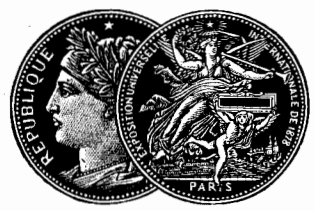

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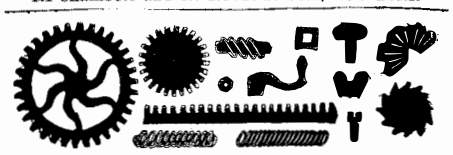

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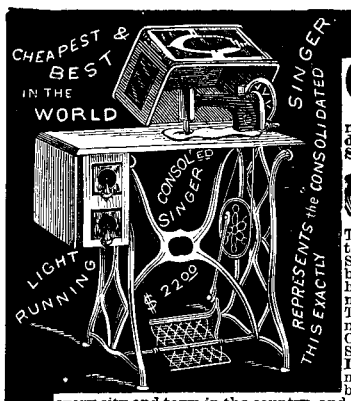

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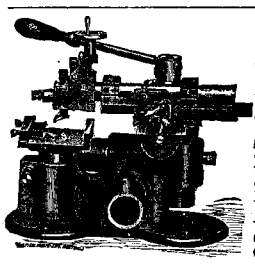

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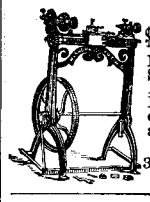

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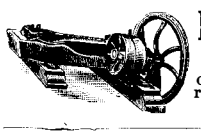

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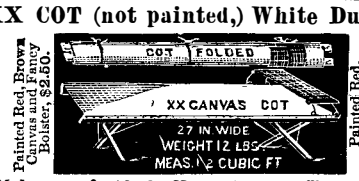
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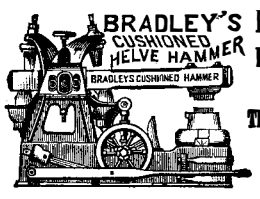

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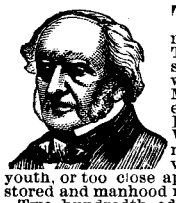

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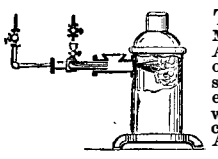

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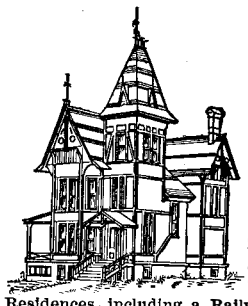

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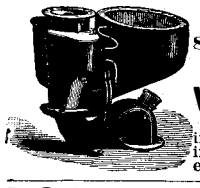

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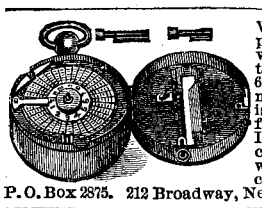

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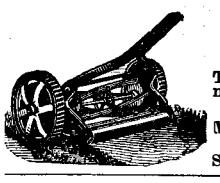

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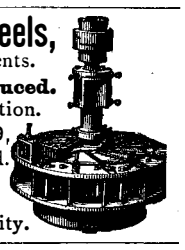

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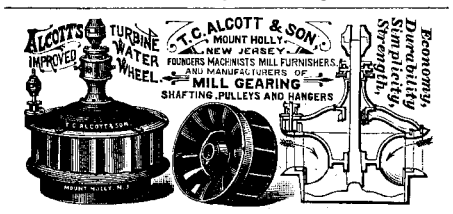
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